THE ROLE OF FINE URBAN GRAIN IN SECURING THE DIVERSITY OF THE URBAN CENTRE

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CONTENTS

CHAPTER 4 CONCEPTUAL MODEL

CHAPTER 5 RESEARCH METHODOLOGY

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

ACA	Architectural Conservation Area
ATCM	Association of Town Centre Managers
BID	BusinesS Improvement District
CLG	Department of Communities and Local Government
CSO	Central Statistics Office
CUG	Coarse urban grain
DBIS	Department of Business, Innovation and Skills
DECLG	Department of Environment, Communities and Local Government
DEHLG	Department of Environment, Heritage and Local Government
DoE	Department of Environment
DELG	Department of Environment and Local Government
DoENI	Department of Environment, Northern Ireland
DETR	Department of Environment, Transport and the Regions
FCM	Functional Constellation Mapping
FUG	Fine urban grain
GIS	Geographical Information Systems
LA	Local Authority
LPA	Local Planning Authority
LUF	Land Use Frequency
LUM	Land Use Mix
MTI	Mix Type Index
MUI	Mixed Use Index
NESC	National Economic and Social Council
NPPF	National Planning Policy Framework
NTA	National Transport Authority
PA	Planning Authority
PDA	Planning and Development Acts
REI	Retail Excellence Ireland
SMEs	Small and medium–sized enterprises
ODPM	Office of the Deputy Prime Minister
TCPA	Town and Country Planning Acts
UGI	Urban Grain Index

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ABSTRACT

Diversity is a key concept in urban and planning theory and policy with important physical, social and economic dimensions. It is also central to the sustainable city and a key component of vital and viable urban centres. Urban form plays a key role in physical diversity, however, its relationship with other social and economic aspects of diversity remains poorly understood. Urban grain is a key part of the urban form of all places, and it too has suffered from a lack of research and investigation. Urban grain is essentially a description of the pattern of plots in an urban block and when this pattern is dominated by small plots it is described as fine urban grain. Fine urban grain is notable as it is surrounded by numerous claims about the range of benefits that it provides for mix of use, mix of ownership, mix of business, streetscape and street life in the urban centre. These claims are very significant as they are all, in one way or another, related to the important concept of diversity. In spite of the significance of the claims, there is a lack of awareness of the role and potential benefits of fine urban grain for diversity, particularly in practice. This, alongside current processes of urban planning and property development, is slowly but surely leading to a depletion of fine urban grain in many urban centres in Ireland and Britain. A greater understanding of fine urban grain and its benefits is urgently required as its continued loss may irreversibly damage the diversity that all urban centres rely on for their survival.

This research explores the role of fine urban grain in securing the diversity of the urban centre. In particular, it explores the rhetorical claims linking fine urban grain and mix of use, mix of ownership and mix of business. The lack of empirical evidence behind these claims is a significant gap in the knowledge in this area and a part of a larger issue around the need for more research on urban form, particularly at the local level. A case study approach, investigating two precincts in Dublin city centre, is adopted for the research and it utilises a range of existing and new techniques for data collection and analysis. Significantly, new advanced spatial analysis techniques for measuring urban grain and mix of use are developed for this research. The findings show the robustness of the research methodology and provide significant new evidence in this area. The research highlights the implications of the findings for theory and practice and it makes recommendations for change in current planning practice. The research also identifies areas where further investigation would help to reduce further the knowledge gaps in this area.

1 INTRODUCTION

1.1 General

The concept of the sustainable city is central to the philosophy of sustainable development. Urban centres are the apotheosis of the sustainable city, providing the multi-functional hubs for exchange, commerce, living and so much more. Diversity is a key concept and long-established objective of urban theory and policy with important social, economic and physical dimensions. It is particularly important to the urban centre where it contributes to the key planning objectives of vitality and viability.

For many years the connection between the physical dimensions of the city, the urban form, and the other social and economic dimensions has been claimed. Although this connection may seem to most as logical and in line with common sense, there has been surprisingly little research done to date on its measurement and generalisation, particularly at the local spatial level. Much study in this area is based on rhetoric and advocacy rather than robust evidence.

Even though urban grain is acknowledged as a key element of the hierarchy of urban form, it too remains poorly researched. Fine urban grain (an urban grain where small plots predominate) is particularly notable in that it is the subject of advocacy in academic and professional circles based on a range of the claimed benefits, particularly for the urban centre. These claims are eclectic in nature, but they all assert that significant social, economic and urban quality benefits are bestowed by fine urban grain. These claims are very significant as they are all, in one way or another, related to diversity.

Despite these claimed benefits, fine urban grain is slowly but surely being depleted in urban centres through a combination of planning policy and urban development processes. If the claims around fine urban grain are true, then its depletion could be damaging the diversity and threatening the vitality and viability of urban centres on which all cities depend. This research is focused on exploring fine urban grain, its theoretical, practice and urban context, its relationship with the range of claims contained in the literature in this area and its implications for theory and practice. It is hoped that this research can inform better policy and practice for urban centres and urban grain.

1.2 This chapter

The purpose of this chapter is to provide an introduction to the research and to summarise the research context, significance and approach. At the outset this chapter outlines the terms, concepts and claims around fine urban grain. This is followed by an outline of the essential urban and planning policy context. The chapter then considers the significance and timeliness of the research. This is followed by an outline of the research methodology, which covers the approach and techniques for data collection and analysis. The chapter concludes with an outline of the structure of the thesis.

1.3 Urban grain

In approaching this research it is important to reflect on the definition and the characteristics of urban grain and its place in the range of elements that make up the urban form of all urban areas. The term, which is of relatively recent origins, is a metaphor for patterning in the urban fabric and it is based on the variety of the patterns observed in the fibre of wood. Although it was originally coined by Jacobs (1969) and expanded on by Lynch (1981), the term only entered common usage in planning and urban design guidance in the late-1990s. While it is now in common usage, it is often confused with other terms in urban studies and urban planning practice (Rudlin and Falk, 2009). Indeed, in recent years it was used to describe both the pattern of urban blocks and the pattern of plots within the urban block (DETR, 2000). However, the most recent work in this area confines the meaning of urban grain to the pattern of urban plots within the urban block (Campbell, 2011; Tarbatt, 2012) and this meaning is adopted for this research.

Fine urban grain is a type of urban grain and one, which is used to describe the dominance of a pattern of many small plots within an urban block. In contrast, coarse urban grain refers to the dominance of a pattern of just one or relatively few, medium or large-sized plots in an urban block. The principal 'identifier' or metric of the small plot is its relatively short length of street frontage, which is almost always less than 10m in length. Other plots are normally categorised as medium or large and these are the principal components of coarse urban grain.

Transformation is a key feature of urban grain as it is ultimately a product of larger and changing social, economic and environmental contexts (Kostoff, 1991). The transformation of urban grain is a significant part of the change in the urban form in

all settlements. Indeed, it has been described as the greatest change in the urban form of cities in the 20th Century (Haughton and Hunter, 1994). In essence, the transformation is a gradual amalgamation of many small plots to make fewer, larger plots (Carmona, 2003; Larkham, 2005) and it is normally carried out to accommodate redevelopment. Although it has been suggested that this is a cycle that will eventually result in re-subdivision (Conzen, 1960; Whitehand and Whiehand, 1984, 2007), there is little evidence on the ground to suggest that this not a one-way process of amalgamation and loss of fine urban grain (Kostoff, 1991; Ward, 1989; Monteiro and Knight, 2012).

The contrast between the fortunes of fine urban grain in the urban centre and fine urban grain in suburban neighbourhoods is notable, particularly in Ireland and Britain. In suburban neighbourhoods the preference for single household units on small, individual plots has effectively preserved and extended the pattern of fine urban grain, albeit in a low density, low scale and single land use format. Recent efforts to promote and guide fine urban grain have tended to focus on the residential and suburban neighbourhoods rather than the urban centre (English Partnerships, 2000, 2007; Tarbatt, 2012). Similarly, the much-heralded fine urban grain projects elsewhere in Europe (such as Freiburg, Germany and Borneo, Sporenburg and Ijburg in Amsterdam) are almost all new neighbourhoods with coarse urban grain centres. Put simply, fine urban grain has not materialised in recent times in the development and redevelopment of urban centres.

1.4 Urban grain, planning and development

The planning system and the development sector have a major bearing on the change and transformation of urban grain in urban centres. Although the planning systems in Ireland and Britain do not regulate the subdivision or amalgamation of the plot, they do regulate the uses and structures associated with fine urban grain. There are many aspects of the planning codes such as plan-making, development management and special controls, which could be used to manage urban grain, however, there is little evidence of this in current practice.

Higher level planning policy and guidance in Ireland and Britain (for example, CLG, 2012a; DECLG, 2012), which is essential in informing plan-making and development management, is not robust in dealing with urban form and urban grain. Although there is a body of policy and guidance around conservation of built heritage that can

bestow protection on fine urban grain, when it is of heritage merit, there are other urban centre policies that are pro-redevelopment and advocate the identification and amalgamation of small plots.

An added problem is that explicit guidance on urban grain for planners, designers and developers is only provided by non-statutory guidelines and manuals (DETR, 2000; English Partnerships, 2001, 2007). While these are valuable, they are discretionary in nature and appear to have had limited impact on practice in the area of urban grain. Codes dealing explicitly with fine urban grain have recently emerged (Campbell, 2011; Tarbatt, 2012), but they too have no statutory weight and their impact on practice is hard to detect.

The current urban property development model is an important catalyst for change in urban grain and it is driven by the principles of development economics and a model of increasing scale, reflecting larger economies and processes, particularly in the area of retail and office development (Evans, 2004). Typically, developers and investors tend towards larger scale, minimum use mix, ease of sale and management (English Partnerships, 2007). Fine urban grain, which represents a smaller scale, is not optimal when considered against these objectives when other larger scale and more profitable options are available and permitted or even encouraged by the planning system. Indeed, Barton, Grant and Guise (2010, p.262) argue that 'The greatest threat to plots and the small-scale land uses that they accommodate, has been the comprehensive development area and the associated land assembly, such major developments have often proved to be less adaptable to changing economic climates than the smaller plots.'

1.5 Issues and policy for the urban centre

The loss of fine urban grain in the city centre needs to be considered within the larger urban and policy context. The terms and definitions around 'the city centre', 'the town centre' and 'the high street' are interchangeable in the language of policy and research and they share many of the same issues, albeit sometimes at different scales (Department for Business, Innovation and Skills, 2011). For this reason the more-encompassing terms 'urban centre' is preferred in this research.

Despite its essential role in the functioning of the city (Evans, 1997; Williams, 2004), the urban centre faces significant challenges to its longer-term viability. The impact

of the rapid transformation of the city has been particularly evident in inner city areas where the decline of traditional industry and major changes in the global economy were to have a significant, adverse impacts on the physical, social and economic fabric (Roberts and Sykes, 2000; Evans and Jones, 2008; Tallon, 2010). The root causes of decline were many, however, suburbanisation and decentralisation of population were certainly facilitated and compounded by an evermore car dependent population (Barton, Grant and Guise, 2010).

The rapid decline in the fortunes of the urban centre prompted a public policy response across Europe by a range of state agencies and other entities under the umbrella of urban regeneration (Stouten, 2008) and these were driven by themes such as housing, tourism, culture and retail (Jones and Evans, 2008). Although they produced mixed results, these approaches had a major impact on the physical form and character of many urban centres (Whitehand and Whitehand, 1984) where 'scaling-up' of commercial development through site amalgamation or consolidation became the preferred development model.

Despite the adoption of town centre first principles (Jackson and Watkins, 2011) and greater emphasis on more sustainable regeneration (Tallon, 2010) many urban centres remain locked in a spiral of decline. This is particularly evident in the retail sector where competition from the urban edge has long reduced spend in the urban centre and resulted in a rise in vacancy, decline in footfall and lower rental values (Schiller, 1994, Department for Business, Enterprise and Skills, 2011; Portas, 2011; Grimsey, 2013).

Although there are divergent views and prescriptions from different interest groups and advocates on the future of the urban centre, there are some areas of agreement on priorities (e.g. Portas, 2011; Experian and ATCM, 2012; REI, 2012; Grimsey, 2013). These include the need for diversification of the current use mix, greater control of out-of-town development, special measures for vacancy, improved access and parking, improved quality and adaptability of spaces and buildings and better urban centre management and policy.

The current planning policy for the urban centre is rooted in the concept of the sustainable city from which it draws many objectives around the notions of density, intensity of activities, variety of functions and mix of uses, flexibility and adaptability

of the built environment, permeability, mobility and community dimensions (e.g. Haughton and Hunter, 1994; Frey 1999; Jenks and Jones, 2010; Barton, Grant and Guise, 2010). Within the policy, vitality and viability are the two principal planning objectives for the urban centre (Ravenscroft, 2000; ODPM, 2005; CLG, 2012a; DECLG, 2012a). Viability is about the ability of the urban economy to exist into the long-term within levels, which avoid depletion of resources and secure important aspects of social equity (Lynch, 1981). Vitality is, in contrast, shorter-term and concerned with the 'busyness' of a place as measured by such things as footfall, vacancy and rental values.

Diversity is an important contributor to vitality and viability and it is one of the fundamental concepts in urban planning with important implications for society, culture and economy at different urban scales (Stern, 2010). Diversity has been recognised as a key component of the sustainable city for many years (Hunter and Haughton, 1994) and it has been considered an important factor in creative and innovative cities (Hall, 1999). Jacobs (1961) was the first to set out the basic conditions for diversity as mix of uses (more than one primary function), fine urban structure (small urban blocks and street network), variety of building types and ages (particularly older buildings, with different economic yields) and a sufficiently dense concentration of people (living, working and visiting). Since then, planners have promoted physical diversity in order to secure wider social diversity and economic productivity goals (Chapple, 2015). More specifically, physical diversity has been connected to aspects of health and well-being, urban vitality, economic health, ecology, sustainability and social equity (Talen, 2008).

The 'town centre first' principle in plan-making and development management has aimed to secure diversity and the objectives of vitality and viability. The principle has had significant implications for urban grain as it prioritises the town centre for certain uses and it promotes pro-redevelopment objectives, which effectively seek out and promote the amalgamation of smaller sites for development. In this way the pro-redevelopment objectives of the town centre first principle may prove to be a key catalyst in the loss of fine urban grain. It should be noted that there are balancing objectives in current planning policy such as conservation policies and designations, which may confer protection on fine urban grain if it is of appropriate heritage merit.

1.6 Claims for fine urban grain

The literature includes many claims for the benefits of fine urban grain and the contribution it makes to the diversity of the urban centre. It spans general theory of urban form and design (e.g. Carmona *et al.*, 2003; Montgomery, 2003), general planning and urban design practice guidance (e.g. DETR, 2000; English Partnerships, 2000 and 2007) and recent design codes (e.g. Campbell, 2011; Tarbatt, 2012). The relationships between fine urban grain and diversity are considered as 'claims' on the basis of the rhetoric and experiential knowledge underpinning them and due to the fact that a number of them remain untested or inadequately investigated.

Perhaps the most prominent claim is that fine urban grain results in a greater mix of use. Mix of use provides multiple spin-off benefits where local needs are met locally by attractive, vital and thriving places, where employment and local services can be sourced and where there is less need to travel (Barton, Grant and Guise, 2010; DETR, 2000; English Partnerships, 2001, 2007). Mix of use also has a reinforcing effect on local business and economy resulting in 'spillovers' and enhanced local business associations (Cooper *et al.*, 2009).

The connection between fine urban grain and mix of use is made by virtue of the fact that the smaller plots of fine urban grain determine the smaller nature of the buildings within it (Panerai *et al.*, 2004). As a result, fine urban grain comprises many small elements, and higher levels of complexity in mix of use and activities (Moudon, 1994). Proponents of fine urban grain claim that this mix is not present, or only present at very low levels, in coarse urban grain as it comprises fewer elements and, consequently, lower levels of complexity (Campbell, 2011). They also argue that the development process in urban centres often destroys this mix through the processes of plot amalgamation and comprehensive redevelopment.

It is also claimed that fine urban grain has a particular role in attracting and retaining a range of uses, which is essential to the regeneration process in the urban centre (Coupland, 1997; Roberts and Lloyd-Jones, 1997; Montgomery, 2003; Pitts, 2004). The mixed use benefits of fine urban grain are also asserted in the current practice guidance, where it is noted that it provides not just greater building-by-building (horizontal) use mix, but also floor-by-floor (vertical) use mix (DETR, 2000; English Partnerships, 2000). Indeed, a recent practice code for urban grain goes so far as to argue that fine urban grain is 'a pre-condition' to use mixing (Campbell, 2011).

Ownership is a key and defining feature of the plot (Panerai *et al.*, 2004) and it is claimed that fine urban grain gives rise to a greater mix of ownership. This, it is claimed, contributes strongly to the viability of urban centres and the argument has been made that a mix of ownership results in greater levels of local economic and business activity (Robson and Pace, 1983), greater levels of local participation in the local economy, greater continuity of business (Jacobs, 1993), better and deeper business associations, benefits for potential use clusters and spill-overs, greater employment and enhanced local services (Montgomery, 2003; Cooper *et al.*, 2009).

As with the claims for mix of use, the connection between fine urban grain and mix of ownership is made by virtue of the fact that the smaller plots of fine urban grain determine the smaller nature of the buildings within it (Panerai *et al.*, 2004). It is noted that the smaller-sized buildings that are present in fine urban grain provide for smaller-scale spaces and it has been suggested that these smaller spaces can be provided in a range of formats and at different costs. This makes them ideal for smaller scale, independent businesses (McNeill, 2011).

It is claimed that smaller businesses tend to be independent in nature, and that this results in the greater diversity of ownership and tenure in an area (English Partnerships, 2000; Montgomery, 2003). This is supported by Jacobs (1993) who argues that fine urban grain provides more accessible and affordable spaces for locally-owned businesses. He argues that the involvement of locally-owned businesses results in greater participation in the local economy and the benefit of greater continuity of business in an area. Jacobs (1993) also argues that involvement of local business in the local economy contributes to greater mix of use.

Mix of business is another key claim for fine urban grain with three related aspects. The first aspect of the claim is that fine urban grain provides for a greater diversity of business (as reflected by a greater density of individual businesses). This is prominent in the literature and policy for the urban centre, where a strong connection between business mix and diversity is made (Department for Business, Innovation and Skills, 2011). The second aspect of the claim is that fine urban grain is a necessary component or condition for the evening economy. Significantly, the evening economy has been a feature of urban regeneration policy since the early 1990s (Office of the Deputy Prime Minister, 2001; Tallon, 2010) and is seen as

necessary in broadening the role, image and appeal of urban centres in the face of challenging economic trends (Portas, 2011; Grimsey, 2013). The third aspect of the claim is that fine urban grain plays a role in developing better local business relationships. It is suggested that smaller independent businesses typical of fine urban grain have a greater need and desire than large businesses to build relationships with other small local businesses to take advantages of the benefit of agglomeration and association. Local business relationships are also considered important to the health of local businesses, providing for a range of agglomeration benefits (Cooper*, et al.*, 2009).

Another significant claim relates to the positive contribution of fine urban grain to the character and quality of streetscape. The aspects of the claim around the streetscape are aesthetic in nature and include perception and experience. The character and quality of the streetscape is an element of the larger objective of urban quality, itself a component of sustainable cities and an aspect of current urban planning policy for urban centres (DECLG, 2012a; CLG, 2012a).

In the same vein, it is claimed that fine urban grain is an important part of the legacy of the traditional urban centre, which contributes to sense of place and character (Jacobs, 1993; Falk and Rudlin, 2009). It is argued that the complexity of fine urban grain gives rise to a richness and variety, which adds to urban quality and character (Campbell, 2012). In particular, it is argued that it provides a more human scale and pedestrian grain (English Partnerships, 2000) with benefits for the sense of enclosure of streets and spaces (DETR, 2000).

The final substantial claim for the benefits of fine urban grain is in the area of street life. Specifically, it is claimed that streets dominated by short and active frontages produce greater levels of footfall and a broader range and intensity of street activities and interactions such as standing, talking, busking and sitting and that this has a reinforcing effect on a range of other street activities and street life (Gehl 1971, 2010; Mehta, 2013; Rogers Merlino, 2014). It has also been argued that fine urban grain is an essential component of street life and a prerequisite for liveliness, diversity, adaptability and richness of the public domain (Loci, 2010).

While there are other claims for fine urban grain based on natural laws and patterns (Alexander, 1977; Salingaros, 2005), these are not substantial and they are based on *a*

priori arguments, which are not considered to be within the same research philosophy (epistemology) as this research.

In summary, the principal claims for the benefits of fine urban grain could be described as follows:

i. That fine urban grain provides greater mix of use;
ii. That fine urban grain provides greater mix of ownership;
iii. That fine urban grain provides greater mix of business;
iv. That fine urban grain provides enhanced streetscape; and
v. That fine urban grain provides enhanced street life.

1.7 Urban grain and diversity

Despite the eclectic nature of the claims, they are all connected to the key and almost ubiquitous concept of diversity (Figure 1.1) and sit within the larger relationship between the physical dimensions of diversity and the social and economic dimensions of diversity, which has been asserted for many years (Jacobs, 1961). The claimed relationships are also significant given that planners have promoted physical diversity in many aspects of the urban form to secure wider social diversity and economic productivity goals (Chapple, 2015).

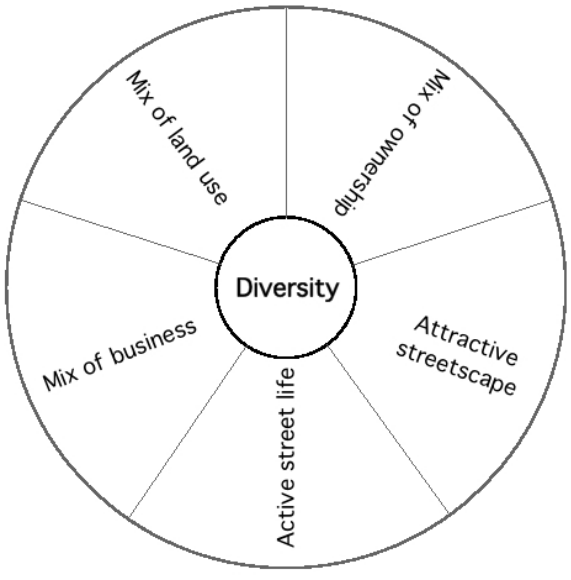


Figure 1.1. Claims for fine urban grain and diversity in the urban centre.

The claims also imply a significant contribution to wider planning and societal objectives given the role that diversity plays in securing vitality and viability of the urban centre. As discussed earlier, vitality and viability are the principal planning objectives for urban centres in Ireland and Britain (Ravenscroft, 2000; ODPM, 2005; CLG, 2012a; DECLG, 2012a). It will also be apparent, if the claims are found to be true, that fine urban grain plays an important role in the larger objectives of urban quality (Montgomery, 1998; ODPM, 2005) and the sustainable city (Frey 1999; Jenks and Jones, 2010; Barton, Grant and Guise, 2010).

1.8 Gaps in knowledge

While the various claims extol the virtues and substantial benefits of fine urban grain, on further, more detailed investigation, the sparseness of the evidence underpinning the claims is revealed. The nature of the evidence underpinning the claims reflects their eclectic nature, in that it is robust in some areas and surprisingly weak in others. Notably, in the area of the streetscape and street life there has been continuous and systematic research carried out over many years. It has succeeded in blending a range of qualitative and quantitative techniques and it has been replicated and enhanced to include a wider range of aspects. While gaps in the knowledge in this area no doubt exist, and there is potential to further enhance methods, there is limited potential for this research to make a worthy contribution to the knowledge in this area.

In contrast, the claims for mix of uses, ownership and business are largely rhetorical in nature. They rely heavily on common sense arguments and references to exceptional and convivial places, while lacking the sort of empirical evidence needed to give them credibility and traction. The lack of systematic research in this area has also resulted in the absence of key performance benchmarks for fine urban grain. Additionally, the absence of 'rules of thumb' or guidelines for optimum mix of use, ownership or business in the urban centre provides a challenge for new research in this area.

There is a clear and urgent need to investigate these claims and to establish their veracity and this needs to be supported by empirical research. Although the absence of evidence to underpin the various claims is the primary gap in the knowledge uncovered in the literature review, there are other significant gaps in more basic aspects of this research area. Most notably, urban grain lacks a robust and

consistently applied definition and a reliable technique for its measurement. Another significant gap in the knowledge is the absence of a coherent overview of the policy and guidance and the interaction of the planning system and development sector with fine urban grain in the urban centre.

1.9 Research significance

This research is significant for a number of reasons. In the broader sense, it aims to close gaps in the knowledge as part of a larger effort to improve the understanding of local level urban form and its connection to key social and economic variables. The knowledge around what actually constitutes sustainable urban form at the local level is still poor and in need of substantial improvement (Jenks and Jones, 2010; Kärrholm, 2011). This research aims to add to existing research in the area of urban grain, which has been described as being (Conzen 2001, p.28) '...surprisingly sparse and capable of substantial extension'. Specifically, it aims to cast a light on the social and economic dimensions of fine urban grain, an area in which additional and sustained research is needed (Jacobs, 1993).

The research aims to provide empirical evidence for the claims in areas where it does not currently exist. The evidence from the research will assist in verifying or challenging the claims in the literature. The research also aims to re-contextualise valuable but dated evidence where it has been provided as part of a claim, for example, in the claim for greater mix of business (e.g. Robson and Pace, 1983).

The research is significant because, in contrast to existing research and practice in the area, it aims to bring together the full range of the context, theory and practice around fine urban grain. This has not been provided in previous research in this area. The research will also consider the connection between fine urban grain and the claims in a new conceptual model, which clearly identifies the variables and the hypothesised relationships between these.

The research also aims to highlight the seriousness of the problems in this research area. Fine urban grain continues to be lost in urban centres without a clear understanding of its role and contribution to diversity. The research will consider how fine urban grain is addressed and treated in the planning system. In particular, it will identify issues and contradictions in the high level planning policy and

weaknesses in current guidelines for practitioners. It is expected that the research will inform a new set of coherent and appropriate planning policies and guidance for urban grain.

The current, and very significant challenges that urban centres face make this research particularly apt and timely. Solutions for the urban centre that are built up from robust evidence, and not solely rhetoric, are urgently needed. The research aims to show the key role urban grain can to play in delivering diversity and contributing to the larger objectives of vitality and viability of the urban centre and the larger sustainability of the city.

1.10 Research aims and objectives

The overall aim of this research is to determine the effects of urban grain on the diversity of the urban centre. In order to achieve this aim, the research has been structured around five research objectives. These are:

i. To establish a clear understanding of the terms, concepts and claims around urban grain in the urban centre;
ii. To establish the relevant theoretical, urban and planning policy context for the urban centre;
iii. To develop and implement a research methodology for investigating key claims around mix of use, ownership and business for fine urban grain in the urban centre;
iv. To critically analyse and interpret the findings of the research and their implications for the current theory; and
v. To provide policy and practice recommendations for urban grain in the urban centre.

1.11 Research methodology

The research methodology is based on a hierarchy, which includes research philosophy, research approach and research techniques (Groat and Wang, 2002; Creswell, 2003; Robson, 2011). The conceptual model for the research is based on the research aim and questions and it identifies the main variables and the hypothesised relationships between them. The research is explanatory and exploratory in nature (Lawrence, 1997) and it takes a mixed methods, deductive

approach where the focus is on testing the relationships between known variables (Cresswell, 2003).

The research adopts the case study approach, given its ability to act as a 'conceptual container' (Groat and Wang, 2002, p.94) and to accommodate a range of techniques to investigate the different variables and the relationships between them. Other elements, such as survey and correlational research are incorporated into the case study approach. Two case studies are chosen on the basis of a set of criteria; one exemplifies fine urban grain and the other exemplifies coarse urban grain. This allows for the independent variable (urban grain) to change within the research. The changes in the relationship with the dependent variables can then be established to provide a comparative dimension to the research.

The two main aspects of the case study approach are data collection and data analysis. The data collection aspect mines a number of different data sources and includes a number of surveys:

- Urban grain survey: This establishes the nature and extent of urban grain in the case studies;
- Land use, ownership and business survey: This is an in-depth survey of all land uses, ownerships and the businesses in the case study areas; and
- Business relationships survey: This is a questionnaire of sampled businesses in the study areas.

Data analysis follows data collection and collation. A range of existing and new advanced spatial and statistical analysis techniques are deployed within the mixed methods approach of this research. The analysis is carried out in four key areas:

- Urban grain: This provides a clear understanding and measurement of urban grain for the case study areas. It requires the development of a new spatial analysis technique for urban grain as none is available in current research or practice.
- Mix of uses: This provides a detailed picture of the mix of uses in the case study areas. The analysis avails of existing techniques and a new technique for measuring mix of uses at a fine level of detail.
- Mix of ownership: This provides a detailed picture of the mix of ownership in the case study areas. The analysis will require the use of a new spatial analysis technique as none is available in current research or practice.

- Mix of business: This provides a detailed picture of the mix of business in the case study areas. It includes aspects such as density of business, evening uses and local business relationships. It requires the development of a new spatial analysis technique and social survey of sampled businesses in the case study areas.

The findings from each claim are summarised and examined to ascertain a deeper understanding of the nature of the underlying relationships between the variables. The findings are then discussed with reference other findings and the current theory and policy in this area. Finally, the implications for current theory and policy are considered and recommendations are made for future research in this area.

1.12 Structure of the thesis

This thesis comprises seven chapters, which are structured around key stages including introduction (Chapter 1), literature review (Chapters 3, 4 and 5), research methodology (Chapter 5) and research findings and analysis (Chapters 6 and 7) (Figure 1.2).

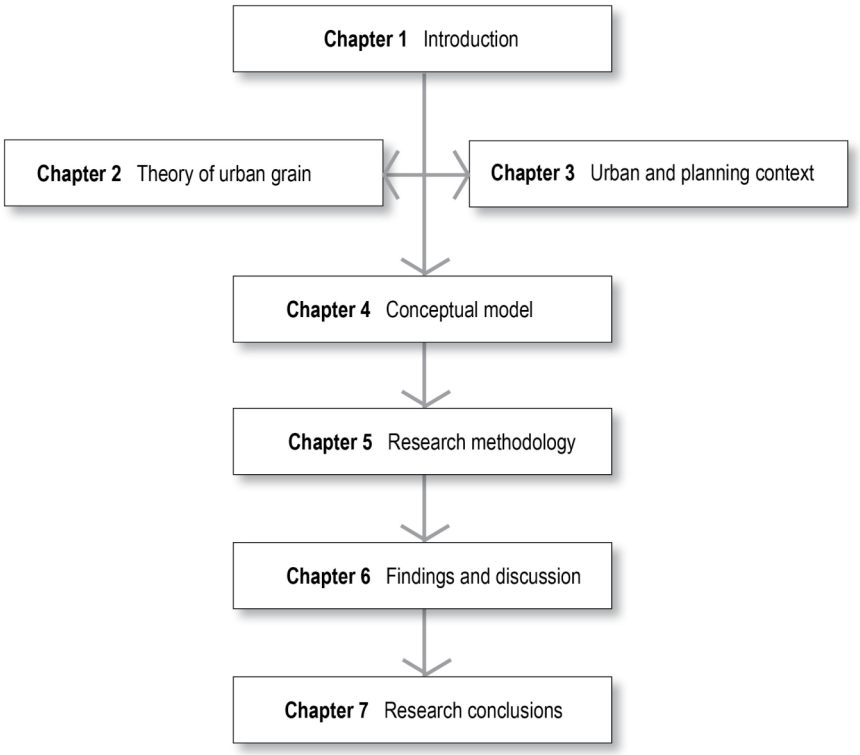


Figure 1.2. The structure of the thesis.

Chapter 1 Introduction

This chapter presents a summary of the research, including the broad research context, the research aim and objectives and research significance. It outlines the research design, including approach and techniques, and it provides an outline of the structure of the thesis.

Chapter 2 Theory of urban grain

This chapter considers in detail the definitions and concepts around fine urban grain and urban form. It explores the range of claims for fine urban grain and the evidence that underpins them. It also discusses the concept of diversity and its relationship with the claims.

Chapter 3 Urban and planning context

This chapter sets out the broad context and challenges for the urban centre. It reviews current policy and practice in urban planning and development as it relates to the urban centre and urban grain. The chapter explores the objectives of vitality and viability in the urban centre and their close relationship with diversity.

Chapter 4 Conceptual model

This chapter presents the conceptual model for the research. The model identifies the boundaries of the model, the key variables in the research and the hypothesised relationships between them. It provides the essential framework for the design for the research methodology.

Chapter 5 Research methodology

This chapter establishes the research philosophy and the overall approach to the research. It details the chosen case study approach and the range of studies undertaken to investigate the relationship between the variables (i.e. the claims). The chapter also sets out the range of techniques employed for data collection and data analysis. This chapter also introduces the two case study areas, which are chosen for the research.

Chapter 6 Findings and discussion

This chapter presents the findings of the research in the areas of urban grain, mix of use, mix of ownership and mix of business. It includes a deeper analysis of the meaning of the findings with particular reference to the current literature and policy. The key findings from this chapter are taken forward into the thesis conclusions.

Chapter 7. Research conclusions

This chapter draws together the overall conclusions of the research with reference to the research aim and objectives. It highlights the implications of the research for theory in the area. It also considers the implications of the research for current planning policy and practice. The chapter outlines the limitations of the research and areas in which future research could be undertaken and it concludes with a reflection on the success of the research in meeting its aim and objectives.

2 THEORY OF URBAN GRAIN

2.1 Introduction

The theoretical framework of this research is included in two separate but cross referenced chapters. This chapter sets out the essential theoretical context for fine urban grain. Chapter 3 sets out the essential urban and planning policy context for fine urban grain and Chapter 4 brings the key elements of Chapters 2 and 3 together in a unified conceptual model for the research.

This chapter contains two main elements. The first is the scope and definition of fine urban grain and related elements, and the second is the set of claims for the benefits of fine urban grain. In setting these out, this chapter fulfils the first objective of this research, which is 'To establish a clear understanding of the terms and concepts around fine urban grain in the urban centre' (Section 1.9, Chapter 1). It also deals with a part of the second objective of the research, which is 'To establish the relevant theoretical, urban and planning policy context for the urban centre.' The urban and planning context are dealt with in Chapter 3, along with current practice around fine urban grain.

The chapter starts with a discussion on the definitions, origins and scope of urban grain. It considers the terms 'urban grain' and 'fine urban grain' and associated elements such as 'the plot' and 'the small plot'. The chapter then considers the role and mechanisms of urban grain in the urban form (or the urban morphology). Following this, the chapter sets out the main claims for fine urban grain as contained in the literature. The robustness of each claim is explored and the main gaps in the knowledge are identified. Key aspects of the claims that would be amenable to more in-depth investigation, particularly of an empirical nature, are also identified. The chapter also acknowledges other claims where the underpinning evidence and research is considered more robust and it concludes with a short summary of the claims and their implications for the research.

2.2 Definition of urban grain

Urban grain is a much used but often confused term in the nomenclature of urban studies and urban planning practice. In essence, the term is a metaphor for patterning in the urban fabric based on the variety of the patterns in the fibres of wood. The term urban grain is of very recent origin, only entering common usage in planning and urban design guidance in the late-1990s. Although it is now a common and widely used term, it is not universal and other terms are used in the literature to describe similar features and patterns. There can also be confusion around the urban scale to which urban grain relates.

Although Jacobs (1969) first referred to grain in the context of the city economy, Lynch (1981, p.265) expanded the use of the term and described it as a way of making explicit the spatial features of the city stating that 'The grain of a settlement is another fundamental feature of its texture, a feature often confounded with density. By grain I mean the way in which the various different elements of a settlement are mixed together in space. These elements may be activities, building types, persons, or other features.'

In recent years the concept of urban grain has been applied mainly to aspects of the physical form of the city rather than aspects of use or activity. In current theory and practice urban grain is often considered as referring to two different and distinct aspects of the urban form; the pattern of urban blocks in any area and the pattern of urban plots (referred to in this research more simply as 'plots') in an urban block.

The significance of urban grain in current urban design and planning practice is highlighted by its inclusion as one of eight, core aspects of development form in what still remains the principal publication for urban design guidance in the planning system in Britain, *By Design: Urban Design in the Planning System – Towards Better Practice* (DETR, 2000). It defines urban grain as (p.16) 'The pattern of the arrangement of street blocks, plots and their buildings in a settlement. The degree to which an area's pattern of blocks and plot subdivisions is respectively small and frequent (fine grain), or large and infrequent (coarse grain).'

The inclusion of both the 'block' and the 'plot' in the definition is confusing as these are two quite different aspects of the urban form. This issue was highlighted by Rudlin and Falk (2009) when they argued that the character of English towns and

cities was defined by a fine urban grain made up of plots rather than blocks. They reference the typical block in the city of London, which is made up of a variety of building plots and buildings, built at different times by different developers and designers and they point to failures in recent regeneration projects where this plot-based grain is not appreciated or incorporated. Architectural publications also tend to consider urban grain as the arrangement of plots and buildings. In some cases the street scale (narrow or wide) is considered a factor in the grain. In particular, fine urban grain has been considered as the combination of narrow streets and small-scale buildings and coarse urban grain as a combination of wide streets and large-scale buildings (Conway and Roensich, 1994).

Generally, practice literature refers to the pattern of urban plots when it considers urban grain. Significantly, the principal resource for urban designers in Britain and Ireland, *The Urban Design Compendium (1 and 2)* (English Partnerships, 2000, 2007) considers urban grain as a function of the parcels or plots within the urban block and not the pattern of blocks in the larger urban structure. It also sets out a range of benefits of a fine grain of plots and it prescribes a fine grain of plots to avoid 'monoculture' (English Partnerships, 2000, p.67). Recent publications in Britain aimed at promoting small plot development have also used urban grain solely as a term to describe the pattern of plots within the urban block (Campbell, 2011; Tarbatt, 2012).

In contrast to an urban grain of plots, an urban grain comprising urban blocks describes very different characteristics of urban form (such as urban block sizing and shaping) with very different implications for other variables such as local street networks, local accessibility and permeability. There is a real need for the terminology in this area to be applied more consistently across the literature. Notwithstanding, this research considers urban grain as referring solely to the patterning of urban plots within the urban block.

2.2.1 Urban grain and urban morphology

To understand urban grain and what constitutes fine urban grain or coarse urban grain, it is necessary to consider the study of urban morphology. Urban morphology is the shape and form of settlements at different spatial levels and its primary concern has been the structure of urban form (Kropf, 2005). In the past, the study of the urban

morphology has been the concern of urban geographers, historians and archaeologists. While considerable research in this area has been carried out over more than 50 years, a weakness in communications between the study of urban form and the practice of urban design has been apparent (Whitehand, 2005, 2007). Indeed, the term 'urban form' is generally used instead of 'urban morphology' in the planning and urban design guidance used by professionals such as planners, architects and urban designers (e.g. DETR, 2000; English Partnerships, 2000, 2007).

The urban plot and urban grain are established elements within the study of the urban morphology. MRG Conzen was a pioneer in this area and proposed streets, plots and buildings as the key elements of local urban form (Figure 2.1).

Figure 2.1. Conzen's Fundamental Elements of the Town Plan (Moudon, 1994). (Used with permission of the publisher)

Different perspectives have since emerged on the key components of the urban morphology, however, most agree that it is organised on the basis of a hierarchy of scales or levels. On this matter Kropf (2005, p.17) states:

'The generic structure of urban form is a hierarchy of levels related part to whole. That is to say, one of the characteristics of urban form is that it divides into distinct levels. The patterns found at different levels such as street/block, plot series, plot, building, cell and structure are not interchangeable and the long-term success of a design depends on understanding not only the differences but also the relationships between levels. The levels are interdependent.'

MP Conzen (2001, p.28) also describes the hierarchy as a 'morphological frame' comprising persisting elements of the ground plan, which shape the succeeding plan development. These elements are the field and property boundaries (in essence the plot), 'fixation lines', which are strong linear elements such as former waterfronts, railway lines and roads and 'the urban cadastre' (the property ownership mosaic). He also noted that systematic research on the urban cadastre and plot patterns had been neglected and was '...surprisingly sparse and capable of substantial extension.'

An alternative perspective of urban morphology is the study of urban form typologies in the discipline areas of architecture and urban design. Panerai (Panerai *et al.*, 2004) has contributed much to this area and he has focused his work on systems within the urban form. He describes the urban tissue (p.158) as '…the superimposition of several structures acting at different scales, but which appear as a system with linkages in each part of the city'. He defines three logical systems:

- The logic of roads and their roles of movement and distribution;
- The logic of plot subdivision, where land holdings are built up and where private and public initiatives take place, and
- The logic of buildings, which contain different activities.

Moudon (1988, 1994) provides the dimension of complexity of elements to the study of the typologies. She developed a 'typomorphological' model of the built landscape, which included elements such as streets, blocks, building types, plot subdivisions and open spaces. This model allowed a clear distinction to be made between the levels of complexity of the urban environment. It found that higher levels of complexity exist where elements are small and their material dimensions are finely detailed. She considers (Moudon, 1994, p.185) that 'Grain is therefore a proxy for the distribution of different types and sizes of elements.' She also found that it was expedient to distinguish between 'fine and coarse-grained' environments.

As can be seen from the range of literature in the study of urban morphology and urban form, there is a strong consensus on the hierarchy and components of the urban form. It is also clear that the plot (and hence urban grain) features in most analyses. In Britain and Ireland, the consensus on the hierarchy of elements of the urban form could be summarised (based on Carmona *et al.*, 2003; Larkham, 2005; Kropf, 2005) as:

- Street pattern;
- Plot pattern;
- Buildings; and
- Land uses.

2.2.2 Change in urban grain

Change or transformation is a key processes within the urban morphology. The process is highly relevant to urban grain as it is ultimately a product of larger and ever-changing social, economic and environmental contexts (Kostoff, 1991). The elements of the urban morphology change at different rates and in accordance with different levels of 'stability' (Carmona *et al.*, 2003). In other words, the more unstable an element is, the more susceptible it is to change. At the bottom level of the hierarchy, land uses are the most unstable elements and the most susceptible to change. Buildings are next, as they are also less resilient to change and have short lifespans relative to other elements of the urban form (i.e. the plot, the urban block and streets). Plot patterns follow buildings, as they are more enduring and often accommodate several changes of building and land use over their lifespan. They are still subject to change brought about by further subdivision and, more commonly, amalgamation and this is normally a part of the process of property disposal or acquisition. This process of amalgamation can be moderated or slowed down by complex ownership patterns or weak local government (Conzen, 2001). Street patterns are the elements of urban morphology considered most enduring and resilient to change. This resilience is a result of the public and capital investment in the street and the greater complexity of procedures and processes required in changing their form (Carmona *et al.*, 2003).

Larkham (2005, p.23) relates this process of change to Britain. He states that:
'… morphological studies have also tended to show that there is a hierarchy of change within urban features. Buildings can change fastest, from alterations to complete demolition and replacement, in reaction to changing use requirements

including an owner's desire to personalise a house. So we have very few surviving medieval buildings, more Georgian, many more Victorian, and so on. Plot patterns can change, by wholesale redevelopment but more commonly through subdivision and amalgamation, often associated with changing ownership. Yet, in many UK towns, there are perceptible traces of medieval plot patterns still persisting, and still influencing new development especially through traditional frontage widths (typically 33 feet). Most resistant to change is the street network, and so again we have towns whose basic structure remains recognisably Roman or medieval; even though in most cases, individual streets have been straightened or widened. Nowadays, the investment in underground infrastructure beneath our streets helps to fossilise this pattern still further.'

The 'burgage cycle', a process of change, which affects urban grain in traditional urban centres, was proposed in a seminal study of medieval towns in Britain over fifty years ago (Conzen, 1960). In this process the traditional urban grain is exposed to slow and incremental change over many generations and sometimes hundreds of years. It comprises a number of distinct stages before it eventually returns to its starting point. These are:

- A repletive stage, where plots are laid out and urban blocks are developed;
- A climax stage where the laying out and development of plots is complete;
- A recessive stage where plots are amalgamated;
- An urban fallow stage, where the process of amalgamation of plots into larger holdings is complete and a stage at which levels of use and activity are low; and finally,
- A return to the repletive stage.

Major physical change to urban grain in post-war urban centres is certainly evident in the urban centres of Ireland and Britain (Whitehand and Whitehand, 1984; Kropf, 2005). On the ground there appears to be little evidence of a return to the repletive or finer grain stage described in the literature. Interestingly, a recent study of change in urban grain in the Smithfield area of Dublin city centre (Figure 2.2) showed a gradual loss of fine urban grain and its replacement with the coarse urban grain between 1756 (when it was fully developed with the first phase of building fabric) and 2004, following the completion of 10 years of comprehensive redevelopment (Loci, 2010). This indicates that the process of change is not, in fact, cyclical and that once plots are amalgamated into coarse urban grain they are rarely, if ever, re-subdivided to

form smaller plots and finer urban grain. The 'one-way' or linear nature of the process is presented by others in the literature (Kostoff, 1991; Ward, 1989; Monteiro and Knight, 2012) on the basis that fine urban grain does not match with the preferences and demands of the property development sector and the emergence of large-scale ownerships (these issues are considered in more detail in Chapter 3, section 3.5).

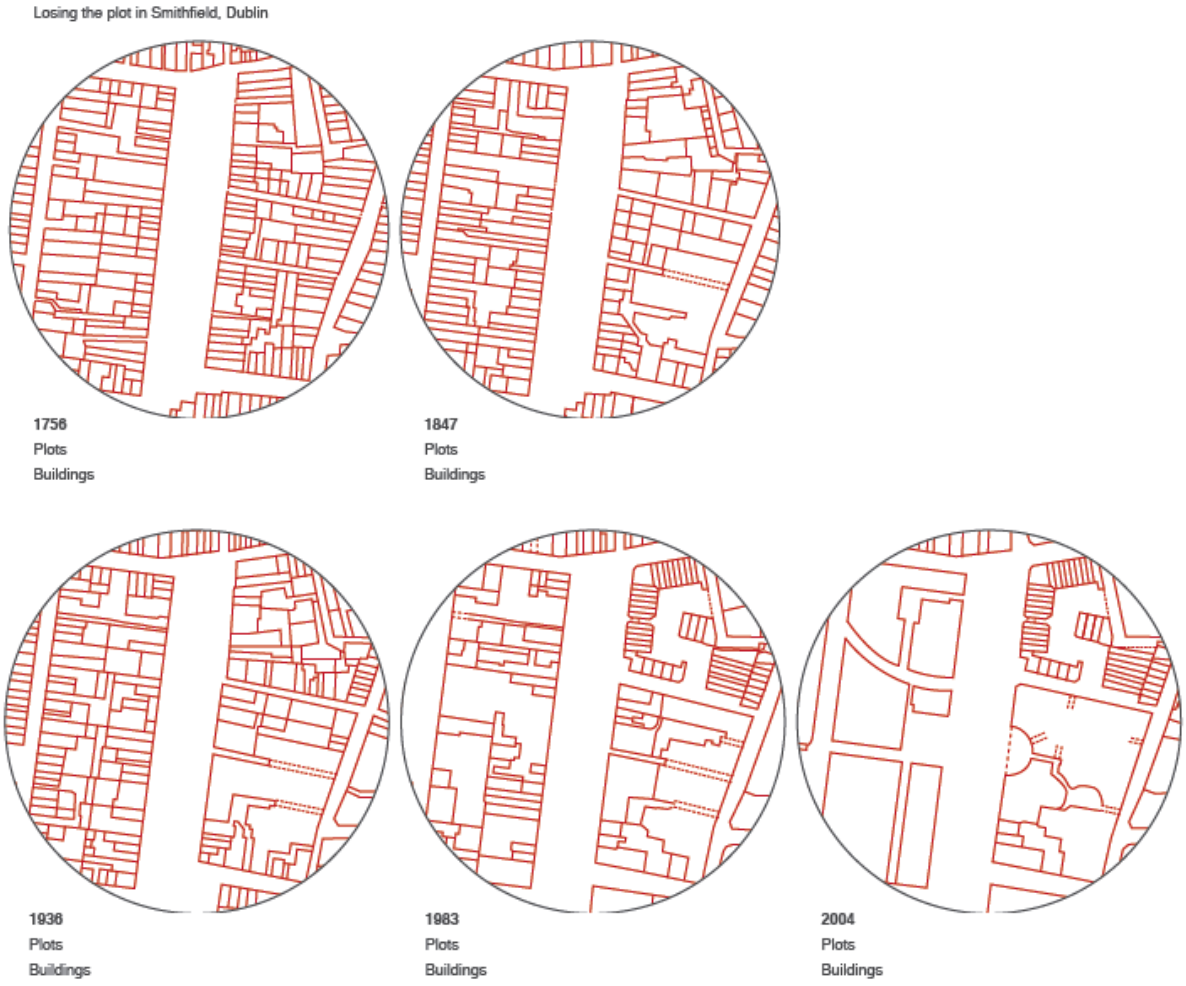


Figure 2.2. Studies of change in urban grain in Smithfield Dublin, 1756-2004 (Loci, 2010). (Used with the permission of the author)

Problems of knowledge transfer between theory and practice are also cited as having a key impact on change in urban form and urban grain. This has resulted in lack of understanding or appreciation of the value and complexities of the urban form, particularly among policy makers and practitioners (Kropf, 2005). A disconnect between urban morphologists and other research and practice disciplines has also

resulted in 'sectional thinking' which has had significant and negative consequences on the form of many cities (Whitehand, 2007).

Finally, it is important to consider the impact of the change in urban grain on the city. It has been argued by Haughton and Hunter (1994) that the greatest changes in urban form occurred in the 20th Century, with the loss of much of the fine grain and the expansion of 'large-grain' cities. They also connected change in urban grain to larger urban processes and practices such as the rise of road transport, with a shift to the urban edge of activity, the growth of large scale business and government and the emergence of functional zoning as a common tool in land use planning.

2.3 Characteristics of the plot

To measure and generalise urban grain it is necessary to first consider the characteristics of the urban plot, which is the principal component of urban grain. While the plot has different physical characteristics, such as buildings and perimeter walls, it also has distinct, non-physical dimensions such as ownership.

2.3.1 Plot ownership

In legal terms, the plot is a unit of ownership, which bestows a variety of legal rights, restrictions and responsibilities (Prendergast, 2011). In Ireland and Britain the ownership is normally defined by a map and written description (folio), which is prepared and lodged by individual parties and maintained on a central property register. This register is maintained solely to record ownerships and changes in ownership, including amalgamations and subdivisions. It is not a means of control of subdivision or amalgamation (Cannon, 2011) as it is in other jurisdictions where the plot is part of a cadastral system (e.g. the US and the majority of other European states). A cadastral system is where all ownerships are recorded and mapped by an authority as part of an overall regulating plan that is used to manage the processes of plot subdivision and amalgamation.

Although the plot is often described as the smallest unit of ownership (Panerai *et al.*, 2004), in reality it can include smaller units, such as stratified ownerships in multi-level, multi-unit developments. Additionally, the process of amalgamation of ownership and subdivision vertically (between floor levels) or horizontally (within plots or with adjoining plots) may not greatly affect the physical fabric of existing buildings or structures. A typical case is the amalgamation of small buildings on

small plots in prime retail streets, which may be connected internally to meet retailer demands for larger footprints.

Legal boundaries and patterns of ownership can also be very difficult to establish on the ground. This is particularly the case in urban centres, where phases of development and changes of ownership over many generations produce very complex ownership patterns. The nature of ownership, which spans freehold and leasehold and the potential for a range of covenants and clauses adds another dimension to this complexity. Bearing this in mind, it could be argued that ownership is the most instable element of the hierarchy described earlier in section 2.2 of this thesis.

2.3.2 Plot features

Plots can be described quite simply as being either regular or irregular in shape. Most plots comprise straight lengths or boundaries (traditionally known as metes). Plots also have 'fronts' to the main street or space, 'tails' to the rear, either abutting another 'tail' or a minor access lane, and 'sides' connecting the 'fronts' and 'tails' (Morris, 1994). One or more lengths can make up a front, tail or side. Most regular plots are rectangular in shape, being longer on one, main axis. The plot front tends to be a shorter dimension than the plot side as this is often the most accessible and, therefore, most valuable part of the plot (Dunne, 2011). As a result most urban plots are deeper than they are wide. The key characteristics of the plot are shown in Figure 2.3.

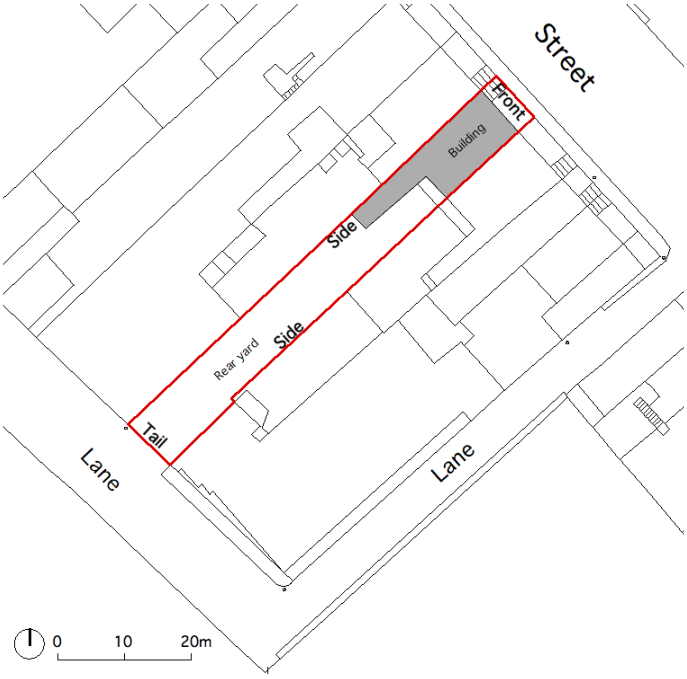


Figure 2.3. The key characteristics of a 'back to lane' plot (Author).

Established urban centres present a wide range of plot types and configurations. Most fall under the following three categories of plot (Carmona, 2003):

- Back to back – with each plot having street frontage and a shared rear plot boundary;
- Back to lane – with street frontage with a rear boundary to a service alley; and
- 'Through' plots – with two frontages onto main streets at each end.

A possible omission from this list is 'corner plots', which have very distinct frontage, depth, land area and access characteristics. In addition, a block that comprises a single plot (a pavilion block) or a 'solid plot', a typology used, for example, in the recent Ijburg development in the Eastern Harbour of Amsterdam (Claus, van Dongen and Schaap, 2001), could be included as a distinct category.

2.3.3 Small plots

While it is common for plots to be described as small, medium or large in current theory, guidelines and practice (DETR, 2000, English Partnerships, 2001, 2007), there are no common or generally accepted metrics or standards for their categorisation. Although size and scale are relative in terms of most elements of the urban form, and there are obvious examples of scale differences in terms of the urban plot in different global contexts (Siksna, 1997), there is, nonetheless, a remarkable universality about the dimensions of the small plot. This is because the human scale, which is constant, is the principal consideration in measuring real size in the urban environment (Moughtin, 2003). In this sense, small plots are very much related to fixed human dimensions and scales across different cultures and regions.

Small plots are almost ubiquitous to urban settlements despite the fact that their prevalence can vary greatly. In the contemporary urban centre they are often historic in nature reflecting periods of organic growth and changing economic and social contexts (Kostoff, 1991). In many urban centres in Britain and Ireland, small plots laid out in medieval times are still evident even though the buildings originally associated with them have since been changed or replaced (Simms, 1979; Tugnutt and Robertson, 1987; Duddy, 2001) (Figures 2.4 and 2.5).

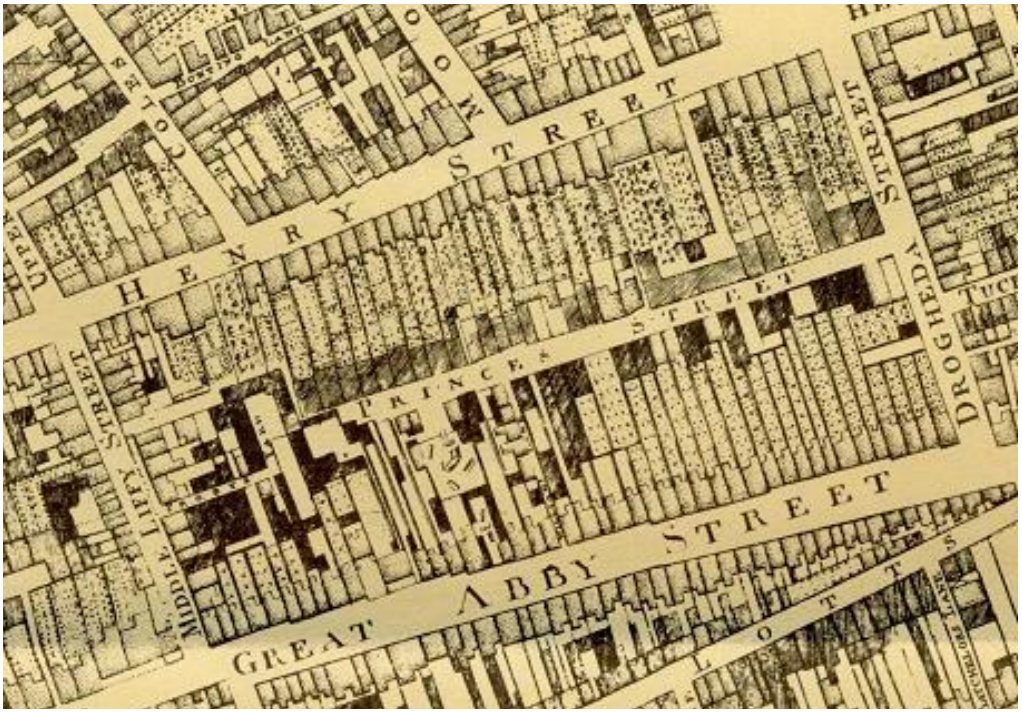


Figure 2.4. The traditional C18th fine urban grain of Dublin's city centre (Roque's Map, 1756). (Used with the permission of the publisher).

Figure 2.5. The traditional fine urban grain of Bristol's city centre, spanning many periods. (Author)

There are very few examples of contemporary, small plot developments of any significant scale in the urban centres of Ireland, Britain or Europe. Most contemporary fine urban grain is limited to very modest urban infill, building replacement on existing plots and demonstration or special projects. This is explored in more detail in Chapter 3 (section 3.7), which is concerned with the current practice around fine urban grain.

2.3.4 Small plot dimensions

For this research the key dimensions of small plots were established by reference to a selection of theory, practice guidance and notable, recent plans and projects in Ireland, Britain, Europe and North America. The analysis (Figure 2.6) shows that plot frontage dimension is the key metric for small plots. Plot area is also a common metric, but it is mostly used in conjunction with plot frontage. In almost all cases it can be seen that the frontage dimension of a small plot is less than 10.0m, with a substantial proportion of small plots having frontages of between 4.0m and 7.0m. Figure 2.7 also shows that there are few small plots with frontage dimensions of less than 10.0m exceeding 300sqm in area. It can also be seen that some small plots comprise as little as 75sqm in area. The relationship between plot frontage dimension and area appears to be a close one and this is certainly reflected in a detailed study of urban blocks in Dublin city centre (Figure 2.7).

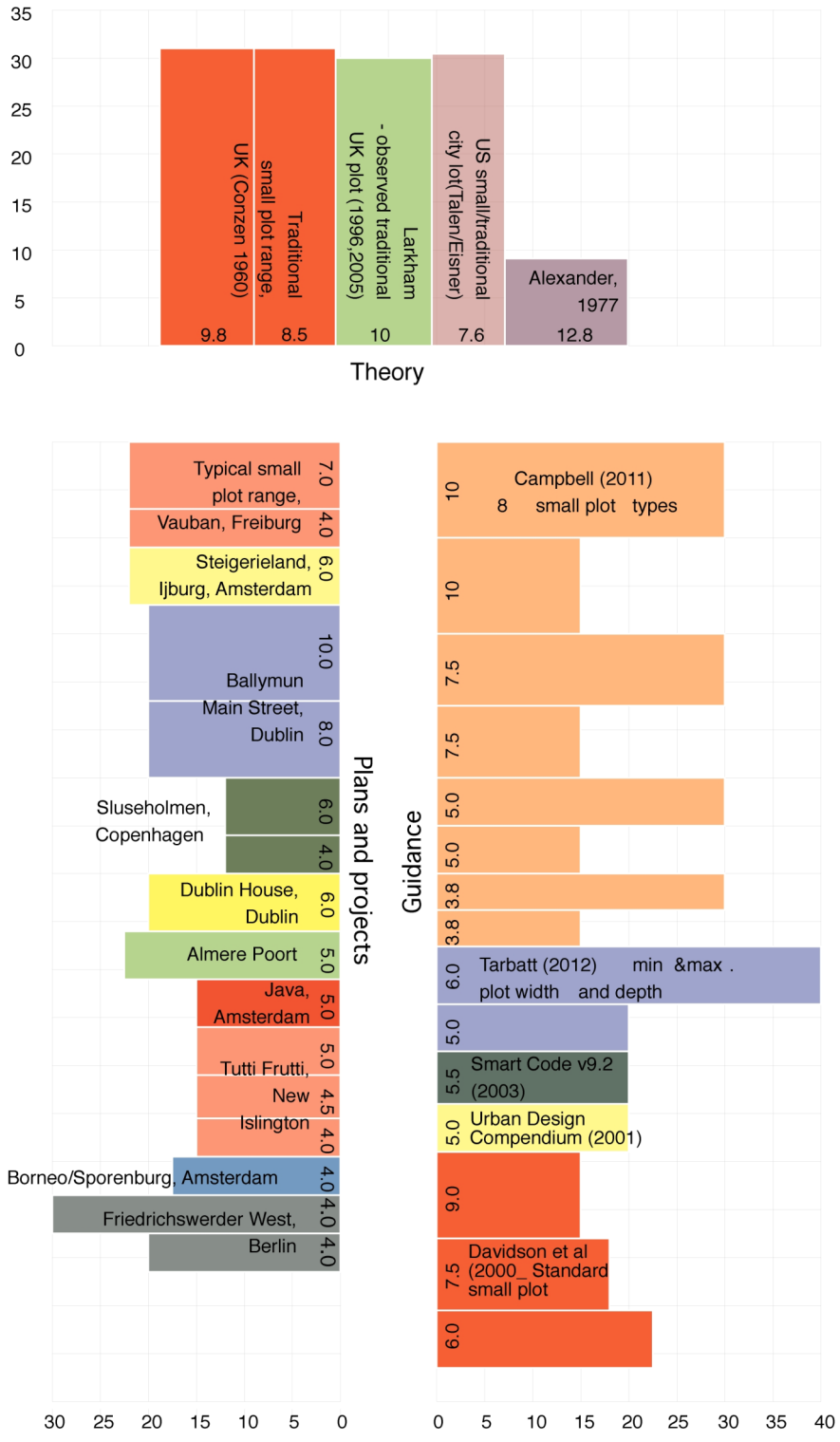


Figure 2.6. Comparative study of small plot dimensions (all dimensions in metres) (Author).

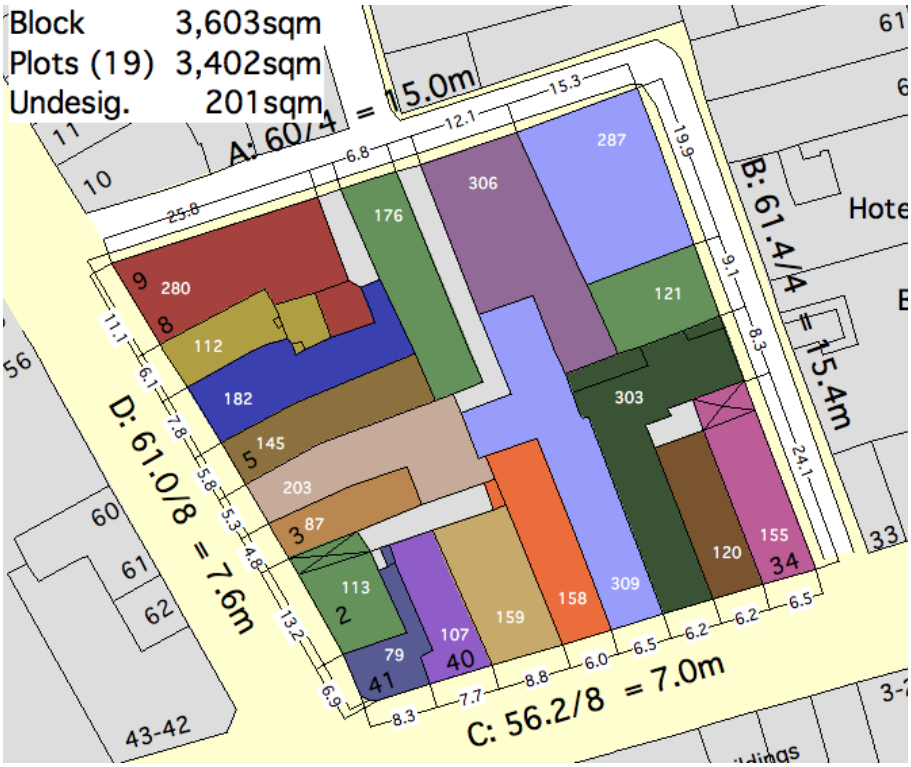


Figure 2.7. Block study of fine urban grain in Dublin city centre (Author).

2.4 Measuring urban grain

As the literature does not provide a technique for measuring urban grain, established metrics and benchmarks do not exist. This is a problem that appears to be related to the lack of sustained research in the larger area of the urban form and urban design (Talen, 2003; Jenks and Jones, 2010; Kärrholm, 2011). The local or urban design level is described by Clifton *et al.* (2008) as the finest level of measurement of the urban form and it is an area where there has been precious little recent research on measurement or generalisation (Longley and Mesev, 2001). Further, there are few tools available to investigate the connections between urban form and aspects and qualities of the urban environment (Ratti and Richens, 2004). There are other common problems associated with metrics for urban form as they often rely on one-dimensional measures, they can be poorly-defined, data sources can be proliferated and there can be a lack of consistency across studies which limits comparison between areas (Song, Popkin and Gordon-Larsen, 2013).

It may also be the case that the lack of benchmarks results from the view held by some researchers that universal measurements are not necessarily appropriate given the uniqueness of local context. Clifton *et al.* (2008, p.34) state that 'Developing

measures of these properties, however, is difficult. Urban design measures cannot be obtained, or computed, from secondary sources, but must be collected through field observation or interviews.' In any case, systematic research on the form and configuration of the plot and urban grain has been identified as neglected, sparse and capable of substantial expansion (Conzen, 2001). Indeed, it could be argued that the plot and urban grain have not been analysed in any systematic or sustained way since the work of the pioneering urban morphologists.

Fortunately for this research, there are approaches to the measurement of other aspects of urban form, albeit in different contexts and scales, which can inform the measurement of urban grain. These fall into two distinct approaches:

- Density or size approaches; and
- Grid cell approaches.

2.4.1 Density-based approach

In a recent study, over 20,000 US neighbourhoods were analysed against a set of metrics for local urban form (Song, Popkin and Gordon-Larsen, 2013). The unit of analysis was the individual neighbourhood and the neighbourhood form metrics were grouped as permeability measures, vitality and accessibility measures and variety measures. These measures included density-based metrics. Notably, 'land patch' (larger homogenous groups of plots and forms) sizes, densities and interspersions within the neighbourhoods were considered significant and useful metrics under the category of vitality and accessibility measures. They were included under this category as it was considered that 'Vitality and accessibility, richness and convenience of places are symbolized by development density' (Song *et al.*, 2013, p.77). Significantly, these metrics were shown to have high levels of correlation (using Simpson's Index, an entropy model) with other key metrics, most notably land use mix (discussed in greater detail in section 2.6).

In another seminal study of the urban form of different residential neighbourhoods in Portland, Oregon, Song and Knaap (2004) used three key 'urban design' measures; street network design, land use intensity and land use pattern (Figure 2.8). Median lot size in the study area was used alongside median building floorspace as the key measures of land use intensity, with smaller lot sizes and larger building floorspaces indicating greater land use intensity. Although the median lot size does not always reflect density across an area, it is another measure of urban grain. The study also

looked at relationships between median lot size and land use mix and found little correlation between these. This is not surprising given the residential nature of the neighbourhoods, which were developed in a zoned, single use suburban format.

Figure 2.8. Study of the urban form in Portland, Oregon (Song and Knaap, 2004). (Used with the permission of the author).

The density approach provides an overview of urban grain within the chosen study boundaries. Importantly, the approach can provide a measure of the 'fineness of urban grain', which can be compared to other areas. However, it cannot, on its own, show the distribution of different types or densities of urban grain within area boundaries. The fixing of boundaries and the unit of data collection are crucial to the success of these studies (Hess, Moudon and Logsdon, 2001) and a potential weakness of this approach is that results can be skewed depending on the choice of area and the inclusion or exclusion of parts of the urban fabric, although this can be addressed by the process of buffering (Malczewski, 2004). A possible refinement of this approach to provide greater detail would be the creation of smaller units of analysis (a block or group of blocks) within the chosen boundary of the study area.

2.4.2 Grid-based approach

The grid-based approach, although not to date used to analyse urban grain, is common in other areas of urban analysis. It involves the creation of cells based on the overlaying of a grid on a different form of spatial data. In Geographical Information Systems (GIS) the process is referred to as rasterisation. Rasters are created through this process, which normally involves the transformation of vector data. Each grid cell has a single value and it becomes homogenous and incapable of providing any information at any finer resolution. Rasters store data in a two-dimensional matrix of uniform grid cells, whereas, vectors normally consist of strings of coordinates and lines/chains and polygons of various configurations, which make up base maps or plans. Rasters are particularly useful as they can be applied across larger areas and can allow for layering of other datasets on the same grid (Pauleit, Ennos and Golding, 2005). Additionally, the raster data model is recognised as the most appropriate approach to the analysis of land use and the development of land use models as it is area-oriented rather than boundary oriented (Malczewski, 2004).

The size of the grid, although sometimes considered arbitrary, is crucial and can vary in scale from sub-metres to kilometres (Longley and Mesev, 2000). The key considerations are the problem being investigated, the nature and complexity of the area under study, the resolution or detail of the information available and the design and expected outcomes of the study itself (Dai *et al.*, 2001). At the local level there is good precedent for grid size. A seminal study of a similar scale on land use in Merseyside (UK) was carried out as far back as 1975 using a 20 by 20 metre grid (Sekliziotis, 1980, cited by Pauleit, Ennos and Golding, 2005) and repeated in 2000 (Pauleit, Ennos and Golding, 2005) (Figure 2.9). A detailed study dedicated to measuring and generalising the urban form also used the 20 by 20 metre grid to measure Bristol's city form (Longley and Mesev, 2000). More recently, a study of land use in mixed use urban areas in India also found this grid to be most appropriate (Bordoloi *et al.*, 2013).

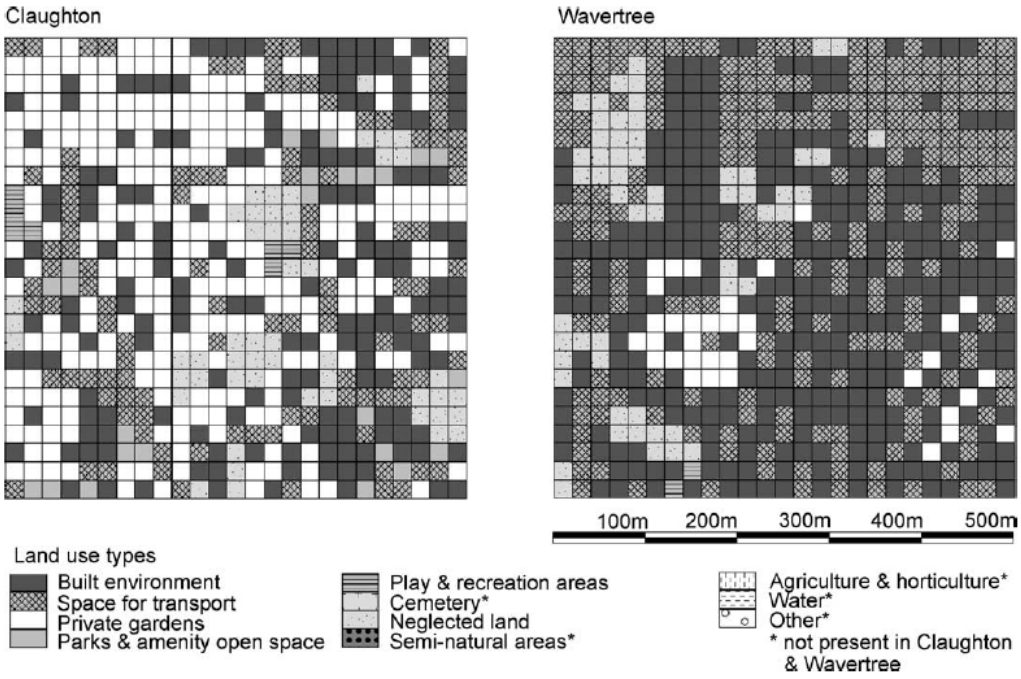


Figure 2.9. Rasterisation of land use in Merseyside, UK (Pauleit, Ennos and Golding, 2005). (Used with the permission of the publisher).

Raster or cell-based based approaches clearly provide an objective way to not just identify urban grain, but also to measure its 'fineness' or 'coarseness' within a study boundary. They also have potential for direct comparison with any other urban area and other variables (such as mix of use) subject to use of the same grid parameters.

2.5 Defining fine urban grain

Defining precisely what constitutes fine urban grain is a difficult exercise as there are a number of questions about its nature, which are not answered in the literature. The literature considers fine urban grain in relative terms only, drawing simple distinctions between patterns of smaller and larger elements. In some cases fine urban grain is described solely as the traditional plot pattern, despite the fact that it exists in some contemporary contexts. Notably, the literature does not specify:

- If it consists solely of small plots or of a prevalence of small plots; or
- What boundaries or spatial basis should be used to measure it (i.e. the area, the block, the street or groups of plots).

If fine urban grain comprises only small plots then it could, in theory, comprise just two or more adjoining small plots within a defined boundary. This would be a simple exercise of identifying small plots. However, as many urban centres now combine a

mix of small and large plots, this approach would not be effective (e.g. urban grain within urban blocks with mixed plot sizes). Current guidance does infer that a dominance or prevalence of small plots constitutes fine urban grain and that dominance or prevalence of large plots constitutes coarse urban grain (English Partnerships, 2000; DETR, 2000).

Any categorisation of fine urban grain requires primary local field observation and study, as these cannot be drawn from solely from secondary sources (Clifton *et al.*, 2008). Table 2.1 shows a grading matrix for urban grain based on different plot densities from observations in Dublin city centre[1] and the review of literature on plot dimensions described in section 2.3.4 and Figures 2.6 and 2.7. This matrix has clear potential as a benchmark for the research findings (Chapter 6)

Urban grain category	**Description of urban grain**	**Net plot density/ha.**
FUG1	Extremely fine	>110
FUG2	Very fine	81-110
FUG3	Strongly fine	56-80
FUG4	Moderately fine	29-55
CUG (>10.0m)	Coarse	<29

Table 2.1. Grading matrix for urban grain

2.6 Diversity and claims for fine urban grain

The literature includes many statements about, and arguments for, the benefits of fine urban grain and the contribution it makes to the diversity of the urban centre. These statements and arguments are also of significance for the key planning objectives of vitality and viability, given the role that diversity plays in achieving these. They are

[1] The author carried out a study of plot sizes (approximately 350 plots were analysed) in Dublin City Centre to inform the research in 2013. It found clear bands within plot frontage dimensions, with clustering of small plot dimensions between 4.0m and 7.0m and a clear step in plot frontage dimensions above 10m. It also showed a close associations between plot frontage and plot area. Theses bands assist in determining the categories in Table 2.1.

designated as 'claims' in this research given the rhetorical and experiential nature of the evidence underpinning them.

Before considering the claims in detail, it is important to reflect on the concept of diversity. Diversity is undoubtedly one of the fundamental concepts in urban planning with important implications for society, culture and economy at different urban scales (Stern, 2010) and it has been recognised as an important factor in creative and innovative cities (Hall, 1999). Diversity is also an almost ubiquitous component of the many versions of, and perspectives on, the sustainable city. Haughton and Hunter's (1994) 'high-level manifesto' for the sustainable city is often cited and within it are key themes, which characterise the sustainable city. A number of these relate to social, economic and physical diversity. Looking across the literature for the sustainable city there is clear endorsement for diversity of functions and mixed-use environment and diversity and flexibility of built forms to provide adaptability to changing socio-economic conditions (e.g. Frey 1999; Jenks and Jones, 2010; Barton, Grant and Guise, 2010).

Jacobs (1961) was the first to set out the basic conditions for diversity as; mix of uses (more than one primary function), fine urban structure (small urban blocks and street network), variety of building types and ages (particularly older buildings, with different economic yields) and a sufficiently dense concentration of people (living, working and visiting). Since then, planners have promoted physical diversity in order to secure wider social diversity and economic productivity goals (Chapple, 2015). More specifically, physical diversity has been connected to aspects of health and well-being, urban vitality, economic health, ecology, sustainability and social equity (Talen, 2008). Significantly, physical diversity at the local level includes fine grain of development and at the building level it includes buildings of different types and ages, flexible design and good space standards (Haughton and Hunter, 1994; Barton, Grant and Guise, 2010; Jenks and Jones, 2010). Notably, diversity is a common theme in many recent sustainable city strategies (e.g. Bristol Partnership, 2009; Dublin City Council, 2013). These aspects of urban and planning policy and practice are discussed in greater detail in Chapter 3 (section 3.2).

The literature for the claims spans general theory of urban form and design (e.g. Jacobs, 1961; Carmona *et al.*, 2003; Montgomery, 2003, Campbell, 2011; Tarbatt, 2012) and general planning and urban design practice guidance (e.g. DETR, 2000;

English Partnerships, 2000 and 2007). On the practice side, planning and urban design practice guidance provides 'endorsements' for fine urban grain, without necessarily discussing or providing the underlying argument or reasoning. These are considered in more detail in Chapter 3, which is concerned with the practice surrounding fine urban grain.

2.6.1 Mix of use and fine urban grain

A key claim in the literature centres on the beneficial role that fine urban grain plays in fostering a wide range and mix of uses (also referred to as mixed use or land use mix). In reflecting on the claim it is important to consider the pervasiveness of the concept of mixed use across general theory and planning policy and guidance. Indeed, it is difficult to find a publication in the last 20 years or so in the area of urban planning theory and policy, which does not endorse mixed use in some way or another.

One of the earliest proponents was Jane Jacobs (1961) who argued for mixed land uses as one of four key components of the larger goal of diversity. Mixed use also provides multiple spin-off benefits where local needs are met locally by attractive, vital and thriving places, where employment and local services can be sourced and where there is less need to travel (Barton, Guise and Grant, 2010; DETR, 2000; English Partnerships, 2001, 2007). Importantly, it has a reinforcing effect which gives rise to business 'spill-overs', enhanced business associations and greater community and social interaction (Cooper *et al.*, 2009). Mixed use also plays a key role in providing choice for people in the urban environment and it interacts with built form and meaning to provide quality of experience (Bentley *et al.*, 1984).

Mixed use is a key feature of the concept of the sustainable city (Haughton and Hunter, 1994; Frey 1999; English Partnerships, 2007; CABE, 2008; Jenks and Jones, 2010; Barton, Grant and Guise, 2010) and it plays a particularly important role in the urban centre and the high street in supporting sustainable communities (Jones, Roberts and Morris, 2007; Barton, Grant and Guise, 2010). It is also argued that there is a strong connection between the land use and built form aspects of a sustainable built environment, although most of the research in this area has been at the city level and not the local level (Cooper *et al.*, 2009; Jenks and Jones, 2010).

As will be discussed in detail in Chapter 3 (section 3.2), mixed use is a key feature of current planning policy and guidance in Britain and Ireland, where it is considered to play a key role in securing the vitality and viability of the urban centre. In Britain mixed use is a key component of sustainable development and diversity in town centres (CLG, 2012). In Ireland, mixed use is included in high-level strategy for sustainable development (DECLG, 2012b) and a range of guidance covering urban design (DECLG, 2009a) and retail development in urban centres (DECLG, 2012c).

Coupland (1997) sums up the advantages and disadvantages of mixed use in the context of city centre regeneration (Figure 2.10). He includes a range of advantages for mixed use, particularly around diversity, vitality, reduced travel demand, improved street spaces and regeneration of buildings and places and he includes disadvantages which are essentially confined to property development and management concerns. These concerns are reflected in other literature in this area where the key areas of concern appear to be practice-related. Issues such as concerns over ease of financing, disposal and management of mixed-use development have been cited by others (Keeping and Shiers, 2004). Other issues such as the possibility of lower rents, access arrangement and incompatibility of uses are also raised (Coupland, 1997). Despite these concerns mixed use appears to be an embedded development concept that is supported, at least in principle, by property development professionals (RICS, 1998). As discussed in Chapter 3 (section 3.6), attitudes towards mixed use among development professionals may be more influential than theory in this area in terms of development outcomes.

Although the arguments for land use mix are prominent, there are limitations associated with research in the area, particularly at the local level. Most studies are based on the larger city scale. Where they are local in scale, they are, by and large, based on simplified categories of land use. It has not been uncommon for studies of land use and urban form to consider only; residential and non-residential uses; residential, commercial and recreation uses; or residential, office, leisure and spectacle uses (van den Hoek, 2008; Pafka, 2013). This simplification of land use is not suited to research of the rich land use mix that is present in the typical urban centre.

Why Mixed Uses?

ADVANTAGES	DISADVANTAGES
Definite	**Definite**
Attractiveness and vitality – diversity; up to 24 hour city	Harder to dispose of property asset quickly
Uses unwanted or obsolete property, including listed buildings	Requires active management of property
Range of uses means greater likelihood of some parts letting	Therefore harder to raise finance and may put some possible tenants off
Possible	**Possible**
Reduction in travel (shorter trips, more multi-function) so reduced emissions; sustainability	Lower rents achieved
	Problems of separate access needed for each use
Reduction in crime; more activity; greater uses; observation of street	Conflict between activities; noise, traffic etc (e.g. housing over wine bar)

Figure 2.10. Advantages and disadvantages of mixed use development (Coupland, 1997). (Used with the permission of the publisher).

In essence, the claim is made that the smaller plots of fine urban grain determine the smaller nature of the buildings (Panerai *et al.*, 2004). Fine urban grain, therefore, comprises many small elements, higher levels of complexity and a greater mix of uses and activities (Moudon, 1994). Proponents of fine urban grain claim that this mix is not present in coarse urban grain as it comprises fewer elements and lower levels of complexity. They also argue that the development process in urban centres often destroys this mix through the processes of plot amalgamation and comprehensive redevelopment (Campbell, 2011; Monteiro and Knight, 2012). It is worth noting that there is no suggestion in the literature that replacement of the fine urban grain with coarser urban grain gives rise to greater use mix.

The role of fine urban grain in providing greater mix of uses is touched on in a number of major publications in urban planning theory. These publications are influential and have informed later work in this area. Jacobs (1961) recognised the close relationship between built form and use mix and the major contribution of fine urban grain (then referred to as smaller properties with short frontages) in

accommodating the smaller, secondary uses of the local city economy. Her claim is significant as she is cited in a number of later claims in the literature (e.g. Montgomery, 2003; Pafka, 2013). Although Jacobs's work remains highly influential, the underpinning evidence is limited and in essence comprises general observations of a single case study area (Greenwich Village in New York) rather than structured survey. Notwithstanding, her work is valuable and a celebrated piece of rhetoric (Robson, 2011).

Significant publications dealing with urban planning highlight the role of fine urban grain in fostering mix of uses and activities, particularly in the area of urban regeneration. It is claimed that fine urban grain attracts and retains a wide range of uses, which is essential in the regeneration of urban centres (Coupland, 1997; Roberts and Lloyd-Jones, 1997). In particular, a connection is made between fine urban grain as a provider of the smaller buildings necessary to host the numerous smaller scale uses and activities on which successful regeneration depends (Pitts, 2004). Montgomery (2003) asserts that fine urban grain plays a particularly important role in securing the mix of uses and activities necessary for culture-led urban regeneration. He states (p.299) that an intensity of built form is essential in securing mixed use and that it is present in areas with ' … a tight rather than a loose urban grain.'

The role of the small plot and fine urban grain in providing for enhanced mixed use is highlighted in current practice guidance and codes for urban design and planning. These publications highlight the nature of urban grain within the hierarchy of urban form (DETR, 2000) and set out a range of benefits, including mixed use, which derive from fine urban grain (English Partnerships, 2000, 2007). These practice publications are discussed in greater detail in Chapter 3 (section 3.4).

Urban design codes have become a more common feature of urban guidance in recent years. In this vein, Campbell (2011) provides a generic code based on the plot and lots (consisting of a number of plots). The small plot provides much of the basis for his 'theorem', which advocates the replacement of rigid masterplanning with a generic and organic approach based on a small number of basic rules. Campbell identifies the small plot as the smallest unit of delivery and, significantly, a pre-condition to use mixing. However, he provides no evidence to support this assertion. Rather, he proceeds by providing a definition of a theorem (p.5) as '…an idea, belief, method or statement generally accepted as true or worthwhile without proof.' The

argument presented by Campbell (2011) for mixed use and fine urban grain is, therefore, rhetorical.

The Plot (Tarbatt, 2012) is a 'pattern book' of designs for small plots that promotes residential 'self-building' on individual plots in different urban contexts. Tarbatt argues that fine urban grain fosters a mix and intensity of uses and activities and he notes in the context of the urban centre, that this makes an important contribution to the high street, which is, or should be, the focus of sustainable communities. He does not include any evidence to support this claim, instead he states (Tarbatt, 2012, p.14) that his prescriptions and assumptions on fine urban grain ' … are based on the simple premises, observed by a range of studies and urban design guidance that smaller plot subdivisions facilitate greater diversity, and thereby help to create more successful places and more sustainable communities.' This work should also be considered as rhetoric.

2.6.1.1 Research connecting mix of use and urban from

There have been few recent examples of systematic and structured work connecting mix of uses and urban grain. Those that have been carried out are not directly related but are, nonetheless, of relevance to the research. A recent study by Pafka (2013) presented an alternative means of describing local land use mixing, urban grain and local pedestrian movement using a method referred to as Functional Constellation Mapping (FCM) (Figure 2.11). The study observed a connection between higher levels of land use mix (residential, office, leisure and spectacle) and finer urban grain. Notably, Pafka observed that land use mixing was greater in the central business district (CBD) than in other sampled urban contexts and concluded that this was due to higher building density and higher levels of access. He also observed that land use mixing was greater in CBDs with a finer urban grain and more irregular street pattern. The observations were not, at that time, supported by statistical analysis.

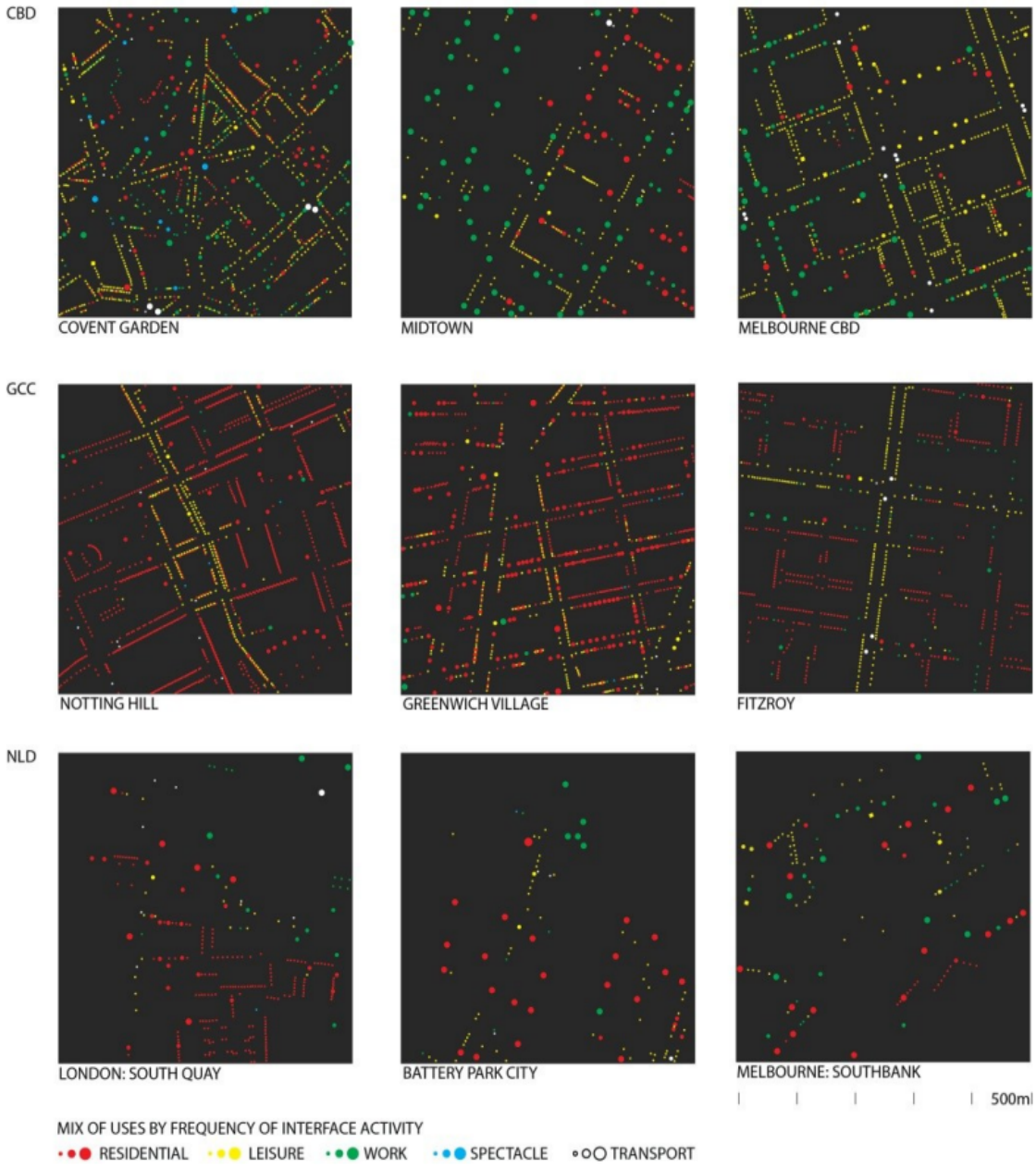


Figure 2.11. FCM for central business districts (CBD) precincts (Pafka, 2013). (Used with the permission of the author).

As discussed earlier in this chapter (section 2.4.1) a recent study by Song, Popkin and Gordon-Larsen (2013) analysed urban form metrics across more than 20,000 US neighbourhoods. Using Simpson's Entropy Index, they carried out an analysis of land use mix. From a value range of between 0.0 and 1.0, they returned a mean score of between 0.54 and 0.58, a minimum of 0.00 and a maximum of between 0.80 and 0.83 and a standard deviation of between 0.16 and 0.18, all depending on the buffer size (the area surrounding the principal area of analysis). Significantly, high levels of positive correlation between use mix and land patch sizes, densities and

interspersions were found using Pearson's correlation coefficient (between 0.67 and 0.91, in a range of between -1.0 and +1.0). This study is of significance for the design of the research methodology as it utilises basic land use mix indices and correlative analysis and it indicates a relationship between similar, albeit larger scale, elements of urban form and land use mix.

Another recent study of land use mix using a similar entropy model was carried out in Stellenbosch in South Africa (Musakwe and Niekerk, 2012; Musakwe 2013). The study found concentrations of land use mix in the city centre and surrounding neighbourhood centres. Although the study did not specifically consider urban grain, it did reveal a relationship between medium to high densities of buildings (which could be seen as a general indicator of urban grain), increased building scale and a higher levels of land use mixing. However, this relationship was not described statistically in the research. In terms of benchmarks, the study indicates bands for mix of use as follows:

- <0.20 - very low LUM (land use mix);
- 0.21-0.4-0 - low LUM;
- 0.41-0.60 – average LUM;
- 0.61-0.80 - high LUM; and
- >0.80 - very high LUM.

Although the claims for the benefits of fine urban grain for mix of use are 'loud and clear' the underpinning evidence is surprisingly sparse. Rhetoric based on heuristics such as observation of particular cases or practical and professional experience is the primary basis for the claims (e.g. Jacobs, 1961; Campbell 2011). Some later claims in the literature could also be considered as new rhetoric (e.g. Montgomery 2003; Tarbatt, 2012) based on old rhetoric (most notably Jacobs, 1961) where there is no attempt to establish the original, underpinning evidence.

The structured research that has been carried out in the larger area of mixed use and local urban form has expanded significantly in recent years. Aspects of the research are of relevance to this research, particularly in the area of general approaches and methods. General benchmarks are provided by these studies although they relate to different aspects of local urban form across different urban contexts (Musakwe and Niekerk, 2012; Musakwe, 2013; Song, Popkin and Gordon-Larsen, 2013). The work on FCM (Pafka, 2013) is interesting as it indicates a relationship between fine urban

grain and greater use mix in city centres. However, a similar approach cannot be taken in this research as it is lacking in statistical analysis and it is prepared and presented in a format that is difficult to replicate.

2.6.2 Mix of ownership and fine urban grain

Mix of ownership has been a feature of the discussion around urban centres for many years and it has been linked with the larger objective of diversity in the urban centre. The argument has been made that a mix of ownership results in greater levels of local participation in the local economy and greater continuity of local business (Jacobs, 1993). It has also been argued that this wider range of ownerships delivers greater levels of local economic and business activity (Robson and Pace, 1983). Other arguments for the benefits of mix of ownership include better and deeper business associations, benefits for potential use clusters and spill-overs, greater employment and enhanced local services (Jenks and Jones, 2010; Cooper *et al*., 2009).

The New Economics Foundation (NEF) has been particularly active in the debate about ownership on the high street and the urban centre in recent years. Along with a concern over declining land use mix on the high street they have highlighted the ongoing loss of smaller, independent businesses and the dominance of national or international multiples or chains (normally considered as businesses with more than 6 stores nationwide) and the resulting vacancy and loss of unique character and sense of place (NEF, 2010). These processes, they argue, are leading to 'Clone Towns' across Britain. They do not, however, address specifically the relationship between urban grain and ownership or the impacts of change in ownership from independent to multiple or chain ownership on the urban grain of the urban centre.

Portas (2011) in her manifesto for the high street, highlighted the importance of small-scale business ownership by local entrepreneurs to the local economy and communities. Experian and ATCM (2012) recommended a range of supports for independent business in the town centre, including local business grants, support for pop-up shops, entrepreneurship mentoring schemes, retraining schemes and a balance between budget, mass, and premium retailers. Power (2011), in a report for the retail sector in Ireland, highlighted the important role of the independent retailer in the local economy and community, the strong growth of the multiple retailer and their role in the displacement of small independent retailers. Notably, the report finds that small independent business creates and sustains proportionately more employment than the

multiple or chain retailers (although a detailed breakdown of figures by location or retail type is not included).

Ownership is a key and defining feature of the plot and Panerai *et al.* (2004, p.162) state: 'Interdependent, but distinctive, the plots provide the construction processes with a fixed legal and real estate framework, which conditions the evolution of buildings and the types of use by the inhabitants.' It is noted that the smaller-sized buildings that are present in fine urban grain provide for smaller-scale spaces and it has been suggested that these smaller spaces can be provided in a range of formats and at different costs. This makes them ideal for smaller scale businesses (McNeill, 2011). It is also noted that smaller businesses tend to be independent in nature, and that this results in the greater diversity of ownership and tenure in an area (English Partnerships, 2000; Montgomery, 2003).

Jacobs (1993) highlights the role of fine urban grain in providing more accessible and affordable spaces for locally-owned, independent businesses and the benefits this has for participation in the local economy and continuity of business in an area. Jacobs also connects the involvement of local business in the local economy with greater mix of use. His arguments are normative and based on experiential knowledge gained from successful places and they are not supported by empirical evidence.

It is also claimed that fine urban grain is a key component of urban regeneration through its hosting of a variety of ownerships and tenures (Pitts, 2004). Montgomery (2003, p296) also makes this claim, in the more specific context of culture-led regeneration of urban centres. His key indicators for successful urban regeneration include the tight urban grain and '…patterns of mixed land ownership so that self-improvement and small-scale investment in property is possible … the proportions of locally owned or more generally independent businesses, particularly shops;' The claims made by Pitts (2004) and Montgomery (2003) also appear to be normative and based on experiential knowledge as no empirical evidence is offered in support of them.

A number of sources associate the loss of fine urban grain with a decline in the mix of ownership. Decline or loss of ownership mix was seen by many as one of the principal casualties of the post-war comprehensive redevelopment of many urban centres in Britain, where large tracts of the urban centre, and in some cases public

streets, were absorbed into single private ownerships (Robson and Pace, 1983; Ward, 1989). Proponents of fine urban grain believe that this process is ongoing and causing great damage to the city (Campbell, 2012) and evidence (albeit in need of updating) of the loss of independent business and their replacement with chains or multiples following the redevelopment of fine urban grain, was provided by Robson and Pace (1983).

The absence of empirical evidence connecting fine urban grain and greater mix of ownership is a key gap in the knowledge in this area. Further, the relationship between these variables has not been tested by recent research. A better understanding of the relationship between fine urban grain and ownership would be an important contribution to the debate in this area and would be relevant to future policy making and practice for the urban centre.

2.6.3 Mix of business and fine urban grain

The benefits of fine urban grain for mix of business is another key claim in the literature. The claim has a number of related aspects. This first aspect of the claim is that fine urban grain provides for a greater density of individual businesses. The second aspect of the claim is that fine urban grain is essential for the evening economy. The third aspect of the claim is that fine urban grain provides for enhanced local business activity.

Diversity of business has become a central feature of recent research and debate on the urban centre. In general terms, mix of business has been seen as important in expanding local economies (Quigley, 1998). A recent report included diversity of business as a key performance indicator for the high street (Department for Business, Innovation and Skills, 2011, p.107) stating that a '…successful high street can be determined by the range and variety of facilities on offer and the diversity of uses and users. The more there is to offer, the more people are likely to visit, so diversity is a driver of footfall.' The report continued that diversity '…can also indicate resilience and adaptability: a high street with a wide range of uses is less vulnerable to technological or fashion changes that could lead to the loss of particular markets.'

The evening economy is the second aspect of this claim and one that has been a significant feature of urban regeneration policy since the early 1990s (Tallon, 2010). High-level policy is generally supportive of the evening economy and its contribution

to diversity. In Ireland the diversity of day and evening uses is a required matter for inclusion in city and town centre strategies (DECLG, 2013). In Britain, developing the evening economy is generally endorsed by planning policy, with important caveats for local issues, such as transport, safety, anti-social behaviour, noise and litter (ODPM, 2001). Increasingly, the evening economy is seen as a necessity in broadening the role and appeal of the urban centre in the face of challenging economic trends (Portas, 2011; Grimsey, 2013) and addressing low levels of resilience. Diversity of business activity into the evening is also seen as a potential catalyst for re-branding or re-imaging of places (Experian and ATCM, 2012).

The third aspect of the claim is the role that fine urban grain plays in developing better local business relationships. Studies of city centre businesses in Britain have shown that a high value is placed on proximity to other similar businesses and local supplied networks (alongside central location, affordability and transport provision) (Cooper *et al., 2009*). Strong, local business relationships are also seen as a key element of a sustainable city where benefits accrue from the agglomeration of uses and businesses at different scales (Jenks and Jones, 2010). Jacobs (1969) in her work on the urban economy referred to this process of interlinking local primary and secondary uses and businesses as 'growing a fine grain city economy.'

As with the claims for mix of uses and ownerships, this claim is essentially based on the connection between fine urban grain and the smaller buildings and workspaces that it provides. In particular, it is claimed that heightened levels of interaction and intensity of small businesses occur in fine urban grain and that this enhances the diversity and richness of local business activity business. It is also claimed that smaller businesses tend to be more diverse in nature and that these businesses tend to have stronger relationships with other local businesses (Montgomery, 2003; English Partnerships, 2000). These local business relationships include:

- Business spillovers – business and trade spreading to other nearby uses, for example through recommendations and browsing;
- Business clusters – arising from the attraction for consumers of choice of nearby competitor businesses;
- Spin-offs of new business arising from larger or established businesses in the area; and
- Local services, such as post offices and health centres.

Robson and Pace (1983) conducted research over a number of years in the 1970s and 1980s on the loss of established mixed-use areas and the traditional urban fabric in cities such as Newcastle, Glasgow and Edinburgh, through the ongoing processes of urban renewal and comprehensive redevelopment. Their findings linked the loss of business variety in areas of overlapping functions to comprehensive redevelopment of the traditional urban fabric (typically comprising fine urban grain). While they noted that increased overall floor areas and increased units sizes resulted from comprehensive redevelopment, they also noted, in contrast, a loss of business diversity (speciality shops), occupation of units mainly by branches or national multiples and substantially lower overall employment levels with an increased part-time employment component. Their work highlighted the weaknesses of the prevailing and simplistic approaches to renewal and their negative impacts on the scale and structure of vital, local economic and employment activities. They were also critical of the role of Local Authorities in facilitating this approach to renewal which effectively increased the vulnerability of these areas.

Along with the diversity of primary and secondary uses, Montgomery (2003) stressed the importance of the local, small-firm economy in the context of the regeneration of the urban centre. He stressed the need for strong local business relationships (p.297) stating that 'As a rule, the most lively and interesting cultural quarters tend to be places of complex variety, with a large representation of small-scale business activity which trades not only with 'consumers' but also with other businesses … the successful cultural-quarter economy will be as complex and intricate as possible with myriad networks of firms - and, crucially, a high proportion of small and medium enterprises (SMEs) inter-trading and subcontracting.' In achieving a strong local, small–firm economy, Montgomery (2003, p.299) highlights the importance of the fine-grain urban morphology, a variety and adaptability of building stock and active frontages which is notably secured in a dense ' … town or cityscape, and particularly those with a tight rather than a loose urban grain.' Pitts (2004) also highlighted the role of fine urban grain and the smaller buildings in fostering the sort of uses needed for a more diverse local economy.

In the context of urban regeneration and cultural quarters, Montgomery (2003, p.297) asserts that 'Successful cultural quarters will almost certainly have a strong evening economy.' He includes variety and patterns of opening hours and the existence of evening and night-time activity as key indicators and he stresses the important role of

fine-grain urban morphology, a variety and adaptability of building stock and active frontages as part of the built form in securing the evening economy. There are also claims that, with the wider range of potential uses and owners that fine urban grain can offer, opportunities arise to extend business activity into the night-time and weekends in urban centres (McNeill, 2011). In this way fine urban grain can make a strong contribution to revitalisation of the urban centre.

The connection between fine urban grain and evening uses was also made by Six Degrees (2008) in their recommendation for fine urban grain in Sydney, Australia. They stressed the role of fine urban grain in key lanes and streets in revitalising the city centre. In particular, they highlighted the need for fine urban grain to encourage small evening businesses such as small bars and restaurants to locate and thrive in the city centre. They also suggested that a proportion of larger, ground floor frontages in key locations be subdivided to create shorter frontages of less than 6 metres to ensure a greater supply of smaller space and lively spaces. The strategy was based on normative arguments inspired by lively and revitalised city centres such as Melbourne, rather than structured research of a qualitative or quantitative nature.

Although the claims for fine urban grain and mix of businesses are notable in recent policy and research, no underpinning structured or systematic research into this area was uncovered. The claims are normative in nature with a strong reliance on intuition, heuristics and selected cases studies of exceptional places (e.g. English Partnerships, 2000; Montgomery, 2003; Pitts, 2004). The lack of research in this area leaves a gap in the knowledge and this is significant given the pertinence of the debate about the local economy and businesses context of the urban centre.

2.6.4 Streetscape and fine urban grain

Many of the claims for the benefits of fine urban grain are based on its contribution to the character and quality of streets and spaces. These claims are largely aesthetic in nature and include perception and experience of streetscapes. The character and quality of the streetscape is an element of the larger objective of urban quality, which is a component of sustainable cities (Jenks and Jones, 2010) and an aspect of current urban planning policy for urban centres (DECLG, 2012a; CLG, 2012a).

A central aspect of the claim is that fine urban grain bestows benefits for visual or aesthetic qualities of places and spaces. It is also argued that fine urban grain

promotes a more human scale and pedestrian grain (English Partnerships, 2000) with benefits for the sense of enclosure of streets and spaces (DETR, 2000). Fine urban grain is claimed to characterise the most pleasing streets and spaces (Loci, 2010) and Campbell (2012) argues that the complexity of fine urban grain gives rise to a richness and variety, which adds to urban quality and character. It is also claimed that traditional fine urban grain benefits the character of most urban centres (Falk and Rudlin, 2009) and contributes to a strong sense of place, sense of belonging and continuity of character (Jacobs, 1993).

It is also argued that fine urban grain plays an important role in providing the aesthetic quality of rhythm in the streetscape. Rasmussen, (1959) describes rhythm as a combination of vertical divisions of buildings. It is this division that brings about the architectural diversity of many different buildings along a given length of street, which is so important to attractive streetscapes (Jacobs, 1993). Moughtin (2003, p.143) summarises the relationship between rhythm, plots and grain as follows: '…the repetition of similarly sized building bays, which may originally have been dictated by ancient plot subdivisions, sets up a rhythm and establishes a grain for the street that forms a disciplined framework within which variety can be contained and ordered'. It is asserted that larger-scaled, wide plot redevelopments can damage the traditional pattern of narrow plots which provides a group harmony and which is considered an integral part of the British townscape (Tugnutt and Robertson, 1987).

The claim for the streetscape benefits of fine urban grain is normative and based on experiential knowledge which is largely gained from the visual analysis of exemplary case studies. This is considered appropriate for research in the area of aesthetics and streetscape. Also, the research in this area spans many years and it is relatively well documented and covered in current guidance. While further research would strengthen the claim, it could not be said that a significant gap in the knowledge exists in this area.

2.6.5 Street life and fine urban grain

A significant claim for fine urban grain relates to its beneficial role in the street life of urban centres. Over the years a large amount of research has been carried out around this aspect of urban life. Specifically, it is claimed that streets dominated by short and active frontages produce greater levels of street life and that this street life has a

reinforcing effect on a range of other street activities and street life (Gehl 1971, 2010; Mehta, 2013).

Gehl (1971, 2010) who built his influential concept of 'life between buildings' around the interaction of streets and spaces and the surrounding buildings and activities, concludes that narrow and active frontages have very beneficial effects on activities such as walking, sitting and talking and that narrow and active frontages enhance street life by concentrating activities and reducing walking distances, and he states (1971, p.78) that the '…principle of many narrow units and many doors along commercial street provides the best opportunities for buyers and sellers to interact, and the numerous doors provide many exchange points between inside and out.'

Gehl's work has been cited and quoted in many publications over the years. Montgomery (2003, p.301) states, in his outline of street life in good urban quarters, that:

> Good urban quarters are judged by their street life. Good streets need to be active, to accommodate and generate diversity, and they must be permeable. Good streets have well-defined edges and a quality of transparency or visibility at their edges (where the private and public realms meet). For this to happen, there must be a good horizontal grain of active frontages along a street (Gehl, 1994). Thus, in any block of, say, 10 shop units, there might be two food stores, a video store, an off licence, a patisserie, a café-bar, a gallery and restaurant, a pharmacy and a betting shop. Successful quarters will tend to have several such streets, or at least a number of activity nodes between which it is easy to travel between (sic).

Similar research was carried out in North America, focussing on the relationship between fine urban grain (considered at the level of the building and block), vibrancy and older neighbourhoods (Rogers Merlino, 2011). The focus of the study was on determining the role of the physical characteristic or qualities of the street frontage on the activities in the street. The metrics for determining urban quality included building rhythm, the visual and physical quality of the building, building age and building width. Two neighbourhoods in Seattle were chosen which included elements of fine and coarse urban grain of different quality. The study showed a strong connection between the theme of rhythm and ground floor activity and it found

significantly greater levels of street activity in areas of greater urban quality. Rogers Merlino (2011, p.478) summarises her findings as follows:

> …a finer grain block with older building ages corresponds to increased pedestrian activity and street vibrancy. Higher ratings were found on blocks that had shorter average building widths that corresponded with older buildings and more durable materials. Blocks that had long, continuous building facades appeared to provide no interest or engagement for the pedestrian, nor did blocks that had open, empty lots, or buildings with poor material quality.

The study is valuable in that it attempts to more comprehensively and objectively and describe the frontage of fine urban grain. In this way it improves on the short-comings of Gehl's approach. However, it is does not address in any detail aspects of use and activity density or intensity. Also it provides little description of the nature of public domain, including street, footpath and traffic characteristics.

Aspects of use and activity are considered in more detail by another recent study in North America. Mehta (2013) combined social surveys with the observation techniques (behavioural mapping) normally employed in studies on street life. The study investigated reasons for street users to use or choose to be in selected streets. Significantly, in an open question, most respondents referenced mix of shops and stores, followed by meeting place, 'see' activities and other people, followed by character and ambience. Conversely, deterrents for using other street were listed as few stores, visually uninteresting and little variety of uses and stores. Notably, character and ambience was not a strong deterrent to street use. The real value of the study is the addition of social survey, where the opinion of street users is combined with the previous research knowledge.

The research completed to date in the area of the streetscape has been continuous and systematic. The research on fine urban grain and street life has utilised both qualitative and quantitative techniques and it has been maintained and expanded since the early work of Gehl (1971). It is not considered that a significant gap exists in the knowledge around this claim although further research would serve to enhance the existing knowledge.

2.6.6 Patterns and hierarchies and fine urban grain

The concept of patterns is associated with the work of Alexander (1977, 1987). He provides planning and design rules at different spatial scales that include aspects of urban grain. Alexander's later work (Alexander *et al.*, 1987), develops the idea of a universal hierarchy of urban form based on a philosophy of 'organic wholeness' in the built environment where a variety of urban grains (fine, medium and coarse) would co-exist through a piecemeal and balancing process, referred to as 'centring'. In recent times, a similar pattern book or 'theorem' has been developed around the idea of an organic or incremental, bottom up hierarchy of plot, lot, urban block and grid (Campbell, 2012). Similar arguments for fine urban grain based on its intrinsic position in the hierarchy of urban form are also made (Love and Crawford, 2011) without much debate about the underpinning evidence or benefits of such an approach.

Fine urban grain is also present in claims, which are based on a natural and balanced ordering of elements of the urban form (Salingaros, 2005). These are ordered according to size within universal scales and hierarchies, reflecting an inverse power-scaling law. In a similar vein, Salat and Bourdic (2011) argue that fine urban grain is part of a mixed-level, urban structure that is essential to notions of urban complexity, based again on natural and power laws, fractal and distributions.

These claims emerge from a positivist epistemology based on *a priori* assumptions and there is little concern about the relationship between variables or causality. These claims are consequently of limited interest or significance for this research and any further investigation of these claims would require a very different research approach, which would be highly theoretical and of questionable real world relevance.

2.7 The claims, diversity and vitality and viability

The claims are eclectic in nature and have distinct but in many cases overlapping social, economic and physical dimensions. However, it is clear from the literature that the claims are unified by the concept of diversity, whether it is by providing a rich mix of uses, a mixed pattern of ownership, mix of businesses and enhanced business relationships, a rhythmic and attractive streetscape or a range of vibrant frontages, which activate the street and space (Figure 2.12).

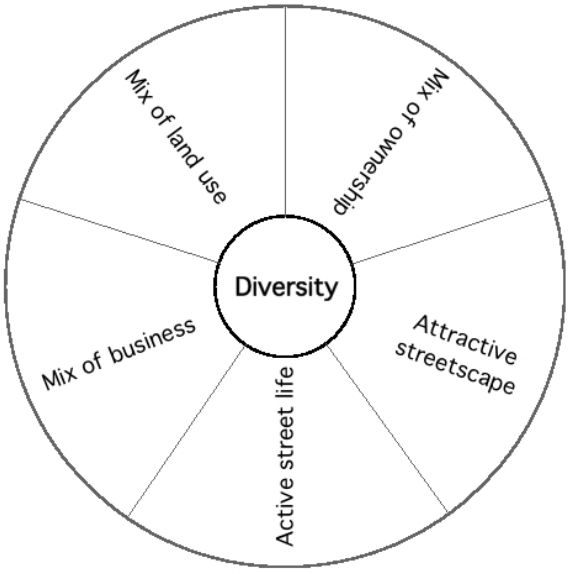


Figure 2.12. Conceptual diagram of the key claims for fine urban grain and diversity.

The claimed relationships between fine urban grain and diversity sit within the larger relationship between physical dimensions of diversity and social and economic dimensions of diversity, which has been debated for many years (Jacobs, 1961). The claimed relationships are also significant given that planners have promoted physical diversity in many aspects of the urban form in order to secure wider social diversity and economic productivity goals (Chapple, 2015).

The claims imply a significant contribution to wider planning and societal objectives given the role that diversity plays in securing vitality and viability of the urban centre. Vitality and viability are the two central planning objectives for urban centres in both Ireland and Britain, having been adopted in the broad policy framework over twenty years ago (DoE, 1995, Ravenscroft, 2000; ODPM, 2005; CLG, 2012a; DECLG, 2012a) (considered in more detail in Chapter 3). In achieving benefits for diversity the claims also assert an important role for fine urban grain in the larger objectives of urban quality (Montgomery, 1998; ODPM, 2005) and the sustainable city (Frey 1999; Jenks and Jones, 2010; Barton, Grant and Guise, 2010).

2.8 Summary

The term urban grain has been used in the past to describe a range of spatial aspects of the city. Most recently, urban grain has referred to the pattern of plots in the urban block. The plot and urban grain are key components of the urban morphology, which is often referred to as the urban form by practitioners in the built environment. Urban grain is the subject of ongoing change and transformation in response to changing social and economic contexts, through the processes of urban planning and development.

The literature and local studies provide key dimensions for the small plot. However, there has been very little research carried out for measuring or generalising urban grain and there are few benchmarks in this area to inform this research. Research has been carried out on measuring related aspects of the built form using density and grid cell based approaches, which utilise GIS techniques. These techniques have potential for measuring urban grain but they need to be augmented by local study and observation if they are to satisfy the research aim and objectives.

The claims span a range of areas and themes. Although they are eclectic in nature, the concept of diversity lies at the heart of them all. In some way each is related to the important concept of diversity, whether it is by providing a rich mix of use, a mixed pattern of ownership, mixed business and enhanced business relationships, rhythmic and attractive streetscapes or vibrant frontages that activate the street and space. The claims are of larger social, economic and urban quality significance given the central role of diversity in achieving the key planning objectives of vitality and viability in the urban centre.

The nature of the evidence underpinning the claims reflects their eclectic nature, as it is robust in parts and surprisingly sparse in others. In the area of streetscape and street life there has been continuous and systematic research carried out over many years. Research in this area has succeeded in blending a range of qualitative and quantitative techniques and it has been replicated and enhanced to include a wider range of techniques and considerations. While gaps in the knowledge in this area no doubt exist, and there is potential to further enhance methods, there is less potential for this research to make a worthy contribution to the knowledge in this area.

In contrast, the claims for mix of use, mix of ownership and mix of business are largely rhetorical in nature. They rely heavily on common sense arguments and references to exceptional and convivial places and they lack underpinning empirical evidence. The lack of systematic research in this area has also resulted in the absence of key performance benchmarks for fine urban grain. These are significant gaps in the knowledge in this area and ones in which new empirical research would make a substantial contribution. The literature review also shows that empirical techniques that have been deployed in other related areas of research could be refined and utilised in the investigation of these claims.

3 URBAN AND PLANNING CONTEXT

3.1 Introduction

This chapter sets out the essential urban and planning context for the research. It addresses issues and challenges for urban centres, the interaction of the planning system and the property development sector with fine urban grain, with specific emphasis on Ireland and Britain. In addressing the policy context this chapter completes the second objective of the research, which is to establish the relevant theoretical, urban and planning policy context for the urban centre. Chapter 2 has already addressed the theoretical context of fine urban grain and both contexts are drawn together in the conceptual model for the research in Chapter 4.

This chapter starts with a discussion around the decline and regeneration of the urban centre. It then provides an outline of key planning issues and policy for the urban centre in Ireland and Britain. The chapter continues with an outline of the main features of the planning legislation in Ireland and Britain, which interact or have the potential to interact with urban grain. The chapter then provides an outline of current planning and urban design guidance for practitioners. This is followed by an outline of the role of the property sector in transforming urban grain in the urban centre and the current situation regarding the delivery of fine urban grain. The chapter then concludes with a summary of the relevant urban and planning context for the research.

3.2 Urban centre regeneration

The role of the urban centre in the city and the main processes that have and still impact on its form and function fundamentally influence the planning and development context of urban grain. The term ‘urban centre’ was chosen for this research as it was clear from the literature that many of the issues affecting town centres and city centres were shared. Indeed, the terms and definitions around the high street, the town centre and other urban centres are interchangeable in the language of policy and research (Department of Business, Innovation and Skills, 2011).

The urban centre was chosen as the urban context for this research as it is plays a crucial role in the city and as Evans (1997, p.1) states, it is '…the heart, even the apotheosis, of our urban civilisation, where a multitude of commercial, retail, cultural and governmental activities and functions are uniquely concentrated.' The urban centre serves many other essential functions in the life of the urban area, such as the market place, education, health, fitness, meeting place, arts, culture, entertainment, tourism and living (Williams, 2004). Revitalised urban centres are a key aspect of sustainable development, delivering critical mass for economic viability and significant, self-reinforcing environmental benefits, such as reduced travel demand, improved public transport and local services (Pitts, 2004). Despite their importance to the city, many urban centres have faced persistent challenges to their longer-term prospects.

Decline has been a feature of many post-war urban centres in Britain and Ireland. The impact of the rapid transformation of the city was particularly evident in inner urban areas, where the decline of traditional industry and major changes in the global economy had a significant impact on the physical, social and economic fabric (Roberts and Sykes, 2000; Evans and Jones, 2008; Tallon, 2010). The processes of 'decentralisation' and 'dispersal' of activities and investment took root and gathered momentum in many cities and were manifested as 'suburbanism' and 'counter-urbanism' (Tallon, 2010). These had dramatic and negative outcomes associated with the decline of inner city populations, such as social exclusion and polarisation of communities (Couch, 1990).

The root causes of decline were many, however, suburbanisation and decentralisation of population was certainly facilitated and compounded by an evermore car dependent population (Barton, Grant and Guise, 2010). This is particularly evident when contrasting the decline of inner city populations and the overall growth of many city populations (Tallon, 2010). Added to this was increased car dependency, which came with new suburban road infrastructure and new points of high accessibility at the urban edge which have proved to be very attractive to many uses, including those traditionally associated with the urban centre.

The rapid decline in the fortunes of the urban centre in the post-war period across Europe prompted a policy response across a range of state agencies and other entities under the banner of urban regeneration (Stouten, 2008). The primary intention of

urban regeneration was, and remains, to bring about the social, economic and environmental transformation of run-down areas. A variety of planning and development themes or models, such as housing, tourism, culture and retail emerged to drive urban regeneration with mixed results in the post-war period (Jones and Evans, 2008). The earlier approaches spanned public sector housing-based regeneration of the 1960s and private sector entrepreneurial regeneration in the 1980s, including the establishment of Enterprise Zones and Urban Development Corporations. These approaches to urban regeneration had major impacts on the form and character of many urban centres where 'scaling-up' of residential and commercial development, through site amalgamation or consolidation, became a preferred development model.

Alongside attempts at urban regeneration of the urban centre was the relaxation of retail planning policy in Britain in the late 1970s (Jackson and Watkins, 2011). Retail, given its importance to the economy of the urban centre, became a powerful and rapid driver of physical change in the urban centres (Whitehand and Whitehand, 1984). In the early stages, other consequences of change may have been less obvious, but research soon began to uncover the range and extent of impacts (both positive and negative) of large-scale commercial developments on the social and economic fabric of the urban centre (Bennison and Davies, 1980; Robson and Pace, 1983). It was becoming apparent that the prevailing planning and development policies were, on the one hand, producing comprehensive change in the urban centre under the banner of urban regeneration, and, on the other hand, producing major expansion and growth of the urban fringe. It is now accepted that these two factors, combined to impact profoundly and detrimentally on many urban centres, allowing much of their economic lifeblood to drain away to the urban fringe (Tallon, 2010).

By the mid-1990s, in response to mounting concerns for the viability of urban centres, and in many cases highly visible evidence of decline, planning policy took a major change of course. Changes in legislation and policy sought public and private sector partnership, enhanced environmental awareness, neighbourhood regeneration, and it placed and emphasis on employment, training and enterprise. The manifesto, *Towards an Urban Renaissance*, (Urban Task Force, 1999), was an important milestone and a catalyst for change in urban regeneration (Jones and Evans, 2008) and greater emphasis was placed on aspects of sustainability in urban regeneration through the process of urban design and urban planning (Tallon, 2010). Significantly,

retail policy also changed to include a sequential approach that prioritised the urban centre using the 'town centre first' principle and health checks for town centres (Jackson and Watkins, 2011).

In Ireland, urban regeneration as a structured concept was to emerge at a later stage and in a very different social, economic and political context to Britain. The decline of the urban centre had taken root at a much earlier stage and involved long-established social and economic issues (Bissett, 2008). The processes of decentralisation and decline of inner cities, however, were largely analogous to those impacting at that time on smaller towns and cities in Britain. The same suburbanisation and counter-urbanism prevailed with a lack of investment in the centre and the consequent flight of public and private housing to the suburbs. By the early 1980s the process of decline had advanced to a stage at which much of the fabric of urban centres in the Country was in poor social, economic and environmental condition (NESC, 1981).

Crucially, from the 1960s on, the retail sector, an important driver of the economy of the city centre, began to suburbanise. Retail development moved gradually and with increasing scale to the inner suburbs and then to the city edge. This process culminated, in the case of Dublin, in the construction of major regional offices and shopping centres in the city's western, new towns in the 1990s (MacLaran, 2005). Although a retail planning and development order had been in place since the early 1980s, which capped the scale of individual developments, it had limited effect on the cumulative impact of ongoing, suburban retail development and this was later replaced by more comprehensive, area-based retail planning guidance with floorspace thresholds and sequential tests (DEHLG, 2007a).

3.3 Key issues and policy for the urban centre

Despite efforts at urban regeneration, many urban centres have been locked in a spiral of decline. Numerous reports from different sectors and perspectives, which identify current issues and challenges have been published in recent years in an effort to highlight the causes of decline (although most reports focus on the commercial rather than the community role of the urban centre).

Significantly, there has been notable a shift from a concern over shorter-term vitality and urban quality to a more serious concern over the longer-term viability of urban centres. A host of high-level policies has been framed in Ireland and Britain in an effort to address these challenges and to secure more sustainable urban centres.

3.3.1 National level policy

National-level planning policy provides the major component of urban policy in Ireland and Britain. Policies for the urban centre are framed within broad national strategies for sustainable development under social, economic and environmental objectives (CLG, 2012a; DECLG, 2012a). High level policy is strongly influenced by a range of Europe-wide white and green papers supporting the concepts of the sustainable city such as compact urban form, mixed land use, integration of transportation and development and sustainable urban design (European Communities, 1990; European Commission, 1995, 2004).

3.3.2 Vitality and viability of the urban centre

Vitality and viability have been the key planning objectives for the urban centre for over 20 years (DOE, 1993; DOE and URBED, 1994). Viability is a long-term objective aimed at securing the ability of the urban economy to exist and to continue to attract investment into the long-term within levels, which avoid depletion of resources and secure important aspects of social equity (Lynch, 1981; DoENI, 1996; CLG, 2012a; DECLG, 2012a). The social equity aspects of viability include the collective functioning of society and quality of life of the individual (Bramley *et al.*, 2010). The long-term time dimension is a central feature of social viability and is defined as (Yiftachel and Hedgcock, 1993, p.140) ' … the continuing ability of a city to function as a long-term, viable setting for human interaction, communication and cultural development.' Vitality is a shorter term objective which refers to the 'busyness' of an urban centre and it is normally measured by a set of metrics such as footfall, commercial yields, local rental values, vacancy rates, customer views and behaviour and retailer representation (DoENI, 1996; CLG, 2013).

Common themes can be extracted from recent studies, commentaries and from current planning policy for urban centres in Ireland and Britain (DoENI, 1996, 2014; CLG, 2012; DEHLG, 2012a, 2012b) (Figure 3.1). These can be summarised as:

- A town centre first approach;
- Pro-redevelopment;
- Diversity of uses and activities;

- Quality of public spaces;
- Conservation of built heritage;
- Accessibility, particularly local linkages and public transport; and
- Participation and management.

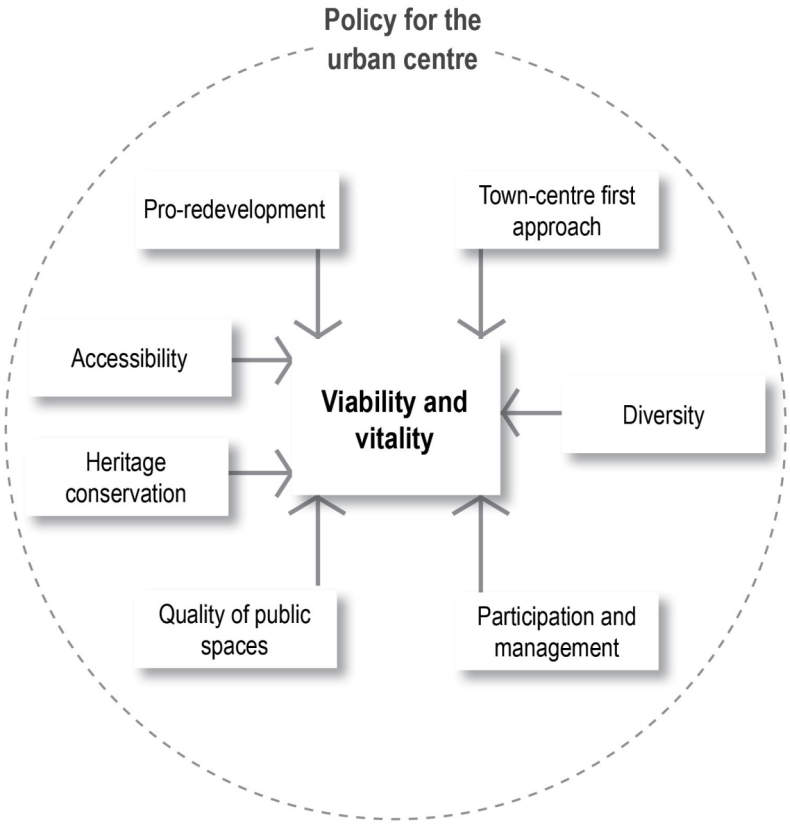


Figure 3.1. Common planning policy themes for the urban centre (Author).

3.3.3 'Town centre first' approach

The need for greater control of town centre uses in out-of-town developments, using appropriate planning controls, remains a strong issue in current studies and commentaries (Portas, 2011; REI, 2012; Federation of Small Businesses, 2012). Interestingly, but perhaps not surprisingly, reports prepared by retail consultants, who commonly work for larger retailers, place the emphasis on the need to adapt town centres rather than control retail elsewhere, such as at the edge of town (Experian and ATCM, 2012; Javelin, 2012; Morton and Dericks, 2013). Although town centre uses continue to migrate to edge locations, there appears to be an acceptance that there is an oversupply of retail and commercial space in Britain and Ireland (Grimsey, 2013; Portas, 2011; NEF, 2010; English Heritage, 2013).

In response to the loss of town centre uses to the urban edge, planning policies have

adopted a 'town centre first' approach, where town centre uses are maintained as a priority in the town centre. The National Planning Policy Framework (NPPF) (CLG, 2012, p.7) requires Local Planning Authorities to '…recognise town centres as the heart of their communities and pursue policies to support their vitality and viability' and it requires a sequential approach to the development of town centre uses, where all opportunities to meet demand in the town centre are exhausted before the edge of centre or suburbs are considered. A similar policy and sequential approach with priority for infill development above 'greenfield' development exists in Ireland through planning guidelines for plan-making (DEHLG, 2007b). The Guidelines also highlight mandatory development plan objectives for the development and renewal of areas in need of regeneration and to bring redundant, under-utilised and derelict land into active use.

3.3.4 Pro-redevelopment of the urban centre

The town centre first approach places renewed emphasis on the urban centre to meet the demand for town centre uses, which are not permitted in out-of-town locations. Significantly, the NPPF (CLG, 2012a) states that 'It is important that needs for retail, leisure, office and other main town centre uses are met in full and are not compromised by limited site availability.' Broadly speaking, policy in Britain and Ireland promotes site redevelopment of a significant scale in the urban centre to meet the needs of the local economy.

In Ireland, guidance for plan-making (DEHLG, 2007b, p.33) stresses the importance of '…activating the development potential of central areas'. It also promotes redevelopment '…through site assembly, identification of opportunity sites and areas and briefs for their development and use'. In particular, retail planning policy requires site identification to accommodate new retail formats while retaining urban character and policies are required to assist the private sector in resolving impediments to redevelopment, which include ownership and built heritage (DECLG, 2012b).

In Britain the NPPF (CLG, 2012a) emphasises the importance of a flexible approach to urban centre development. It requires that plans provide a clear distinction between primary and secondary frontages with appropriate sets of policies for retail development including the allocation of a range of suitable sites to meet the scale and type of retail, leisure, commercial, office, tourism, cultural, community and residential development. Further, the NPPF states (CLG, 2012a, p.7) that 'It is

important that needs for retail, leisure, office and other main town centre uses are met in full and are not compromised by limited site availability.' This is a clear message to Local Planning Authorities (LPAs) to take proactive steps in identifying, zoning and, if necessary, securing suitable sites for redevelopment in urban centres.

The renewed and proactive approach to site identification and redevelopment in Ireland and Britain, while supporting the town centre first approach, brings renewed focus on the redevelopment of the established areas of lower scale and development value. While this may initially target remaining brownfield and obsolete sites, it is also likely to render smaller scale, lower value buildings more attractive for redevelopment, particularly where they are not conferred regulatory protection. Clearly, much of the remaining 'everyday' fine urban grain of urban centres falls within the scope of this pro-redevelopment policy. Added to this potentially adverse policy context is the position of the development sector, which seeks amalgamation of smaller buildings and plots in order to attract larger scale uses, such as retail and residential complexes (Morton and Dericks, 2013).

3.3.5 Greater diversity of uses and activities

The local economy of urban centres has been affected by an over–emphasis and over-reliance on retail. This has had significant effects on the local economy of urban centres as retail is experiencing a range of challenges including a strong trend towards more chains and multiples in larger units, consolidation of retail trade into fewer outlets, an increasingly mobile society, the growth of out of town shopping and internet shopping (Barton, Grant and Guise, 2010). Continuing decline in the share of the retail spend and the rise of internet shopping are seen as key issues for retailing in the urban centre (Experian and ACTM, 2011; Portas, 2011; Javelin, 2012; Grimsey, 2013; Retail Ireland, 2014). In Ireland, an extensive survey of retailers, shoppers and other interest groups (REI, 2012) highlighted a weak mix of use and business mix as key concerns for retailing in the urban centre.

There is also concern in the retail sector around vacancy, a highly visible and key indicator of economic health, particularly at ground floor in urban centres. In Britain there has been a very rapid increase in vacancy to one in six units on high streets with a loss of footfall and lower rental values (Portas, 2011) and the worry is that these trends will consolidate as a downward spiral of decline, where a store closes due to declining footfall, this weakens the performance of nearby stores, the surrounding

area gets weaker, this increases the likelihood of further store closures, which further reduces footfall, and so on (Department for Business, Enterprise and Skills, 2011).

It is recognised that the primary means of addressing vacancy is the attraction of new uses, which may even involve a reduction in overall retail floorspace (NEF, 2010; Experian and ACTM, 2011; Javelin, 2012), renewed emphasis on residential, local services and civic uses (Portas, 2011; Grimsey, 2013; Morton and Dericks, 2013), and the development of local attractions and the evening economy (REI, 2012). A range of initiatives, incentives and disincentives for landlords, increased acquisition powers, stricter planning controls on use changes, community initiatives and temporary or 'meanwhile uses' are also suggested as means to reducing vacancy (Portas, 2011; Grimsey, 2013).

Diversity is a key component of current planning policy for the urban centre (DoENI, 1996, 2014; CLG, 2012a, DECLG, 2013). It emphasises key concepts such as building of a critical mass of complementary uses (including residential cultural, leisure, financial, public administration and, restaurants, bars) within and adjoining prime retail areas. In Ireland, policies encouraging a diversity of uses in the town centre throughout the day and evening must be included in urban centre strategies (DEHLG, 2012a).

Regardless of positive sentiments around diversity of functions, it is clear that urban centre policy remains heavily weighted towards the retail function, with many policies stressing the need for additional retail development in urban centres. Policy also remains highly sectoral in approach, lacking a framework for balanced and integrated urban centre plans which give proper weight to other uses and activities such as small scale office and commercial use, specialist areas of employment, small scale and creative industries, creative, housing with supporting local social services and community facilities.

3.3.6 Improved accessibility

Improving poor levels of access, particularly by public transport, is a key challenge to urban centres. The car-borne populations of Ireland and Britain, enjoy high levels of choice in out-of-town retail, leisure and commercial uses and have become accustomed to high levels and ease of private car access and car parking. In this context, many urban centres struggle to compete and repeated calls have been made for greater amounts of accessible car parking in urban centres (Javelin, 2011;

Experian and ATCM, 2012; Morton and Dericks, 2013). In contrast, there is a concern that policy has focused too much on shorter rather than longer-term solutions around car access and parking (Portas, 2011, Grimsey, 2013) and there is a recognition that improving local public transport is the principal and most appropriate means of increasing access to the urban centre in the medium to longer term (Morton and Dericks, 2013).

Planning policy has sought to balance demands for increased access and high-level policy for more sustainable transport. Accessibility has been a central plank of town centre policy and a key measure of the economic 'health' of the urban centre for at least 20 years (DOE, 1993). While it remains a key policy area in national planning policy, greater emphasis has been placed on the sustainable travel agenda (CLG, 2012a; DECLG, 2012b). In Ireland, sustainable travel is one of five, national policy areas for retail which targets a shift in transport mode to public transport and away form the private car through greater integration of retail development locations and public transport infrastructure and better local linkages and connections for pedestrian, cyclist and local public transport services (DECLG, 2012b).

In Britain, the NPPF (CLG, 2012a) also promotes sustainable transport modes with priority for pedestrian, cyclists and public transport in the urban centre. The importance of achieving a balance of land uses is stressed as it reduces journey lengths for employment shopping, leisure, education and other activities. In dealing with car parking, current policy focuses on the accessibility of development, the availability of public transport and the need to reduce emissions. It also promotes improvement of quality rather than increased quantities of car parking in the urban centre.

Accessibility is a key consideration for the vitality and viability of urban centres and impacts on other planning policy areas. Poor accessibility can reduce the overall vitality and viability of urban centres and this can have knock-on impacts for diversity. On the one hand, accessibility of centres could be seen as a mechanism that sits apart from diversity as it relates primarily to transport and transport infrastructure. On the other, diversity of uses and activities reduces transport requirements and shortens journeys and could be seen as contributing to accessibility. Although the link may be indirect, fine urban grain with its claims for diversity may contribute to the accessibility of the urban centre.

3.3.7 Quality of public spaces

There is a recognition that quality and safety of the public space is a key element of the urban character and the overall attractiveness of the urban centre as a place in which to live, shop and do business (Jones, Roberts and Morris, 2007). The quality of the local environment has been a key consideration in the vitality and viability of urban centres and has been included as a key indicator in town centre health checks and an important factor in attracting shoppers and raising levels of footfall (Centre for Advanced Spatial Analysis, 2000).

More recently, this issue has taken a less prominent role in planning policy, being replaced by a greater emphasis on issues such as diversity of uses and activities. It is notable that the policy for town centres in the NPPF (CLG, 2012a) makes no reference to the quality of public spaces. In contrast, policy in Ireland for retail in urban centres highlights the importance of proper urban spaces and includes a manual on the improvement of the quality of retail development and public spaces in urban centres (DECLG, 2012c).

3.3.8 Conservation of built heritage

While the need for new investment in urban centres is broadly recognised, a sensitive approach to the redevelopment of historic centres is stressed by heritage interests (English Heritage, 2013). A connection has been made been made between a wider range of smaller scale uses and the traditional character and qualities of many urban centres. NEF (2010, p.61), for example, advocates the potential for new initiatives allied with traditional planning approaches when they state that 'The shift towards a smaller scale of project also signifies an increasing sense of community ownership and awareness of local distinctiveness. This has naturally coincided with a greater appreciation of the role that the historic environment and heritage assets play in defining the character and individuality of town and city centres, which are critical factors in determining the quality of experience and competitiveness of many retail and leisure destinations.'

Conservation of built heritage is a key feature of planning policy for the urban centre in Ireland and Britain. While there is a range of generic guidance dealing with conservation of the built heritage, in the context of the town centre policy it is often couched as 'counterbalancing' policy to development. Rather than controlling the extent and scale of retail development, policy requires that modern retail formats be accommodated in a way that maintains the essential character of historic areas

through proper, designed solutions (DEHLG, 2012a, 2012c). In the similar vein, the NPPF (CLGa, 2012) places the emphasis on Local Authorities to identify areas where development would be inappropriate or where a change in the uses of buildings would be inappropriate for environmental or historic reasons. It also places the onus on Local Authorities to provide clear explanations for these restrictions.

Heritage protection is one of the few controls affecting site amalgamation and redevelopment in the urban centre and the tensions with the town centre first and pro-redevelopment policies are apparent. Heritage policies provide protection for fine urban grain only where fine urban grain has heritage merit. The 'everyday' fine urban grain, which is of lesser heritage value, lacks protection, despite the fact that it may contribute in a more general sense to the traditional character of places as discussed in Chapter 2, section 2.6.

3.3.9 Greater participation and management

Poor levels of engagement of local communities in the planning of urban centres has been highlighted as a problem and a key priority for urban centres (Portas, 2011; Grimsey, 2013). The community has often been omitted from the 'retail-centric' view of the town centre, but there have been efforts to address this in the NPPF (CLG, 2012) and the current retail planning guidelines in Ireland (DEHLG, 2012a). In Ireland, the important connection between the community and the centre is highlighted in guidance for local plan making (DEHLG, 2013, p.33) which states that 'Strong city and town centres are especially important to strong local communities, and local area plans can play a key role in activating the development potential of central areas …'

In the past low levels of engagement by local businesses and organisations in local planning policy occurred as a result of 'top-down' retail policies. In recent years, greater engagement of local businesses and business organisations has been included as a key aspect of policy for the urban centre. In Britain, the NPPF (CLGa, 2012) requires LPAs to have a clear understanding of local business and business sentiment. Of particular relevance is the requirement to carry out appropriate studies and the collection of appropriate evidence on local business and business sentiment in preparing local vision for sustainable local development within the framework of the Local and Neighbourhood Plans. This policy is mirrored in the current guidance for retail in town centres in Ireland.

Despite improvement in policy in recent years, a lack of coherent management and joined-up local planning policy in many centres remains a concern in many in recent reports (Department for Business, Enterprise and Skills, 2011, Northern Ireland Executive, 2012, REI, 2012). Notably, many interest groups highlight the important and growing roles of local business communities and organisations such as Business Improvement Districts (BIDs) in effective process and place management. In Ireland, effective management of the urban centre is central to retail policy and broader urban centre strategy and the Business Improvement District model is promoted as an appropriate management framework (DEHLG, 2012a).

3.3.10 Conclusion on urban policy

The common areas of policy for the urban centre span the hierarchy of scale in planning policy, from city or town-wide policies for town centre priority to local policies for buildings and spaces. Policies for the urban centre are remarkably consistent across Ireland, Northern Ireland and Britain and these are fundamental to the shaping of local development plans and ultimately redevelopment in the urban centre. While the policies are all framed to support vitality and viability, it is clear that they may conflict in key areas. This is most apparent in the potential conflict between pro-redevelopment policies and policies to retain and enhance a diversity of uses and activities. If the claims around fine urban grain are shown to be true then the loss of this fabric through pro-redevelopment policies will need to be reassessed to avoid negative outcomes for diversity and vitality and viability in urban centres.

3.4 The planning system

The planning system is the framework within which planning policies, plans and decisions are made. The planning system plays a key role in shaping the urban centre and transforming the urban grain. An understanding of the underlying mechanisms in the planning system is crucial to this research as it may point to key deficiencies or contradictions, which may need to be addressed in the light of the research findings. As with the current planning policy, the overarching role of the planning system is to secure the objectives of sustainable development in urban and rural areas (CLG, 2012a; DEHLG, 2007, DECLG, 2012b). Planning legislation in Ireland and Britain provides the 'ground rules' for the system and seeks to place public interest 'over the private right to develop land and property' (Ratcliffe, Stubbs and Keeping, 2009) and '…to provide, in the interests of the common good, for proper planning and sustainable development' (Planning and Development Act 2000, as amended) (PDA).

3.4.1 Planning consent

The regulation of 'development' is a central function of planning legislation in Britain and Ireland. Much depends on the definition of development as there is a general requirement for planning consent or planning permission for anything that falls under its scope. Significantly, the definition in the legislation does not extend to the concept of property ownership, or the act of subdivision or amalgamation of land or plots (in contrast to other European and Common Law countries, such as the US and Australia, where control of subdivision is a function of the planning system). Nevertheless, the planning systems in Ireland and Britain provide a range of mechanisms for regulating the uses and structures associated with, or reflective of, plots and the urban grain (e.g. construction or alteration to buildings, out-buildings, annexes and walls, changes of the use land and buildings etc.). These are contained in statute such as PDA, Planning and Development Regulations, 2001, Use Classes Order, 2005 and the Town and Country Planning (General Permitted Development) Orders, 1995 and 2008.

3.4.2 Special planning controls

The planning legislation in Ireland and Britain includes special controls where general permitted development or exempted development rights are curtailed. These controls generally relate to the conservation of built and natural heritage. They provide enhanced means to protect the urban fabric, individual buildings and other structures (such as walls and sheds) and associated uses. This is of particular relevance as much of the remaining historic fabric in urban centres comprises traditional, fine urban grain. Consequently, fine urban grain is often conferred protection 'by proxy' when the building and structures it accommodates are of architectural or heritage merit or contribute to the character and appearance of an area.

In Ireland, areas of '…special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest or value...' are protected by the designation of Architectural Conservation Areas (PDA, s.81). This in turn may be followed by designation as an Area of Special Planning Control (PDA, s.85), which may limit or remove certain types of normally exempted development or generally permitted development (PDA, s.87). Conservation Areas were introduced in England and Wales by the Civic Amenities Act 1967. These areas are designated by Local Authorities on the basis of character and appearance, where it is intended to preserve

or enhance special architectural or historic interest [Planning (Listed Buildings and Conservation Areas) Act, 1990].

An important feature of conservation areas is that they are area-based designations with the potential to include built fabric such as buildings, spaces and streetscapes or the pattern of development or 'grain' (Ratcliffe, Stubbs and Keating, 2009, p.203). While none of these controls bring ownership, subdivision or amalgamation into the regulatory framework, they do, nonetheless, provide planning control over the buildings, structures and uses associated with fine urban grain.

3.4.3 Protected structures and listed buildings

In Britain and Ireland the planning legislation allows for the designation of protected structures or listed buildings of significant heritage merit. This brings the requirement for consent or permission for development, which would otherwise be generally permitted or exempted from the development management process. It includes any change, which would materially affect the character of the structure or any element of the structure. The protection normally extends to the curtilage of the building, which means that minor additions or alterations or the demolition of structures such as walls or sheds normally require planning permission (PDA, s.57). In England and Wales, listed buildings, including any associated structures and curtilage, or individual structures of special architectural interest, historic interest or association, or group value are protected from demolition, alteration or extension without first obtaining Listed Building Consent [Planning (Listed Building and Conservation Areas) Act 1990]. This process is distinct from the normal development management process. As with conservation areas, the small plot and fine urban grain are often conferred with protection 'by proxy' when the building and structures it accommodates are of architectural or heritage merit.

3.4.4 Local spatial plans

The local spatial plan (referred to as Local Plans and Local Development Frameworks in Britain and Development Plans and Local Area Plans in Ireland) is a crucial instrument in managing the urban form at the local level. The local spatial plan (including more detailed plans such as masterplans and urban design frameworks) can include a wide range of policies and objectives to guide development at the local level. Although it is not evident in current plan practice the local spatial plan has the clear potential to:

- Establish the extent and role of areas of fine grain in their urban centres (Cussen, 2011);
- Allow for a dialogue with the community, developers and investors which could cover the role and value of fine urban grain (PDA; Town and Country Planning Act, 1990 (TCPA); Planning and Compulsory Purchase Act, 2004; Localism Act, 2011);
- Include general policies in support of the existing, continued and enhanced role of fine urban grain;
- Include site or area-specific objectives or actions, which may seek to maintain existing fine urban grain or use mix in certain locations;
- Include policies and a range of area and site-specific objectives which require the delivery of fine urban grain; and
- Include more detailed guidance or supplementary documents on delivery of fine urban grain, such as a Neighbourhood Plans, Urban Codes and Urban Design Frameworks (PDA, TCPA, Planning and Compulsory Purchase Act, 2004, Localism Act, 2011).

The literature review uncovered very few examples of local spatial plans with specific objectives for the protection or enhancement of the fine urban grain, where it was not included in a formal designation of groups of listed buildings/protected structures or designation of a Conservation Area/Architectural Conservation Area. In most instances fine urban grain was discussed in vague and generic terms and without a spatial or location dimension. This aligns with the observation of Love and Crawford (2011, p.93) in their review of urban design and property development: 'Rarely is the parcel map itself represented as part of the master plan vision, regardless of the fact it is primary tool by which development and city-making are driven.' Figure 3.2 shows a rare example of local spatial plan (a Planning Scheme), which was explicit in its requirement for fine urban grain in a comprehensive urban regeneration context.

Figure 3.2. A rare example of plotting in a local spatial plan in Dublin Docklands (DDDA, 2002). (Used with the permission of the author).

3.4.5 Development management

Development management is the consent process for development proposals and it is based on the statutory development plan and high-level planning guidance. There are essentially two outcomes when determining a planning application; refusal and grant of permission (PDA, s.34). Refusal of permission, for example, for comprehensive redevelopments in the urban centre, may be very important in protecting the physical integrity of the existing small plot or fine urban grain. Permission is normally subject to conditions. Legislation in Ireland and Britain provides for a very broad range of conditions, which can be applied to structures and uses (TCPA, s.72, PDA, s.34). It also extends to considerations that, in their own right, would not constitute development, for example, the nature of occupancy, the naming of new developments and the setting up of management groups. The legislation does not, however, make any direct mention of conditions, which might control future ownership or subdivision.

The development management process could be important for protecting or enhancing existing fine urban grain on a site-by-site or development-by-development basis. As development management is guided by the statutory development plan, it is not altogether surprising that a single, notable case in Ireland or Britain of the use of the development management process to secure or enhance fine urban grain did not come to light in this research.

3.4.6 Development agreements and obligations

LPAs and Planning Authorities (PAs) in Ireland and Britain have extensive and frequently-used legislative provisions for temporary and permanent agreements with other parties. In Ireland this appears to give adequate scope to control ownership and subdivision by agreement (PDA, s.47) as long as this is consistent with the current development plan. Similar provision is made in Britain for planning obligations entered into by agreement, or otherwise, between the Local Planning Authority and any interested party, by way of an enforceable deed, which remains associated with the property title on a temporary or permanent basis (TCPA, s.106).

Agreements or obligations by agreement provide very significant potential for authorities to engage proactively with developers in protecting or delivering fine urban grain or landowners in existing or new urban centres. Significantly, legal agreements framed to provide protection from further subdivision or amalgamation for fine urban grain are likely to be enduring as they involve the very rigorous land and property law requirements around registration and title. Although these agreements are commonly used to control ownership and future development of lands, the literature review did not uncover any such agreement made to cover the protection or creation of the fine urban grain.

3.4.7 Ownership and development by the Local Authority

There is also the possibility of the LPA/PA acting as the developer or investor in securing its own Development Plan policies and objectives. In Ireland and Britain the ability to acquire, by agreement or compulsorily, buildings or land is embedded in the planning legislation (PDA and TCPA). Provision is also made in Ireland for site assembly for redevelopment, a process that can be destructive when it relates to the existing fine urban grain. However, in both Ireland and Britain this power is subject to the policies and objectives of the development plan and in the case of Britain, securing the objectives of sustainable development.

Fine urban grain may not necessarily be threatened by the actions of the LPA/PA in acquiring land, if it is protected by policies and objectives in the current development plan, or it is clearly shown as important in securing objectives of sustainable development. Unfortunately, as discussed earlier in this chapter, fine urban grain is rarely protected by policies and objectives in the development plan. On the positive side, acquisition by the LPA/PA offers potential for maintaining or managing land or property. This could be extended to include land such as fine urban grain in the urban

centre. It could also play a role in securing land for new fine urban grain in the development of new urban centres, if it cannot be provided by other means. The literature review did not uncover any such acquisition or development by a Local Authority to protect or deliver fine urban grain.

3.4.8 Other legislation

There are other areas of legislation, most notably land and property law, which have a bearing on the plot and the fine urban grain. As discussed in Chapter 2, ownership is a key aspect of the plot and one that comes with rights, restrictions and responsibilities. In Ireland and Britain land and property law allows for the private subdivision or amalgamation of land by title, without regulation of plot size or shape and without reference to an overall regulating plan of subdivision or ownership, subject to registration (Law of Property Act 1925, as amended, Land Registration Act, 2002, Registration of Title Acts and the Land and Conveyancing Law Reform Act, 2009). Amongst other provisions, this legislation allows for covenants, which are legal agreements, which affect individual property rights. This is one of the few areas where land and property legislation intersects with planning legislation.

3.5 Planning and urban design guidance

Guidance is an important aspect of the planning system as it informs plan-making and decision-taking (CLG, 2012). Urban grain is not included in the scope of statutory guidance. It is, however, included in non-statutory guidance and best practice codes. These documents are targeted at practitioners, developers and other stakeholders. The current non-statutory guidance is important as it provides useful definitions and scope for fine urban grain and it provides 'endorsements' of fine urban grain which are drawn presumably from the claims in the theory. Aspects of the guidance that contribute to the theoretical context of fine urban grain are also discussed in a number of sections in Chapter 2.

Current guidance on the urban grain appears to be drawn from a combination of urban planning and design theory and earlier, seminal practice publications such as *Responsive Environments* (Bentley *et al.*, 1985) and *Towards and Urban Renaissance* (Urban Task Force, 1999). *By Design* (DETR, 2000) remains the most useful practice guidance on urban design in the planning process in Britain and Ireland. Significantly for this research, it includes urban grain as one of eight, core aspects of development form and it states (p.20) that 'Narrow plot widths promote more active

frontages, increase the sense of enclosure and allow higher densities. They are particularly appropriate where they reflect existing settlement patterns.'

Urban Design Compendium 1 (English Partnerships, 2000) is an influential practice manual and it emphasises key objectives of urban design, including the need for mixed uses and forms and the physical adaptability of buildings and places through design to accommodate changing social and economic circumstances. It also provides explicit guidance and the following strong endorsement for fine urban grain (p.67):

> **Keep plots small and narrow**
>
> Sub-dividing development parcels into plots, which are as small and narrow as is practical, encourages a diversity of forms, uses and tenures and allows a rich variety of buildings to emerge. This also:
>
> - generates more active frontage;
> - encourages a 'human scale' and fine pedestrian grain;
> - enables higher densities to be achieved (larger plots often generate stand-alone pavilion buildings flanked by parking);
> - provides a flexible basis for amalgamation if necessary and enables future incremental growth to take place;
> - minimises costly and wasteful leftover space.
>
> Small, regularly shaped and narrow sub-divisions of, say 5m x 20m accommodate a range of buildings and make the most efficient use of land.

Urban Design Compendium 2 (English Partnerships, 2007) focuses on case examples of best practice. It promotes the benefits of smaller development parcels in new development and recommends that urban grain be sized according to spatial hierarchy, with smaller parcels at more prominent locations to achieve a finer grain.

In Ireland, the *Urban Design Manual* (DEHLG, 2009a) relates solely to residential development in support of the *Residential Planning Guidelines* (DEHLG, 2009b). While it covers a range of design principles at neighbourhood, local and home scales, it focuses mainly on substantial greenfield development and does not deal with the concept of the urban grain in new development or infill in existing urban areas. The *Retail Design Manual* (DECLG, 2012c) attempts to address the design issues around retail development in urban centres. It sets out a number of generic design principles,

which focus on the integration of retail development into the existing fabric and urban space of the urban centre. The guidelines address the urban grain, but only insofar as this relates to variety of frontages and block size and pattern. Disappointingly, there is a failure to discuss or guide new retail development in areas of existing fine urban grain of plots.

The impact of non-statutory guidance on planning practice is hard to gauge. Certainly, the higher level objectives have made it into the written statements of many local spatial plans (Biddulph, 2011) and it is not uncommon to see positive, general comments made about the urban grain in policy and plans, often as part of a longer list of generic urban design objectives. In other publications, such as the *Retail Design Manual* (DECLG, 2012c) the concept of the urban grain is misunderstood and related solely to the pattern of streets and blocks, while excluding urban plots from consideration. As discussed earlier, there are only rare examples of detailed plans with explicit controls for plots and urban grain and this indicates little impact by the guidance on practice in this area. Finally, as will be discussed further in section 3.7 of this chapter, it is clear that the guidance for fine urban grain and, in particular, the explicit guidance for plot sizing and shaping contained in the *Urban Design Compendium 1,* have made little or no impact on recent developments in urban centres.

3.6 Urban property development

The property development sector provides much of the necessary drive and resources to bring about development in the urban centre. Urban property development is an important process within the urban economy and it is based on the basic economic model of supply and demand. The process is somewhat unpredictable as in involves different actors, such as landowners, investors, developers and regulators and different types and levels of regulation, most notably the planning system (Healey, 1994). Urban property development has not always produced good outcomes for the urban centre and fine urban grain has in many cases been a notable 'victim' of the process (Campbell, 2011).

The 'problem' with fine urban grain, from a development perspective, is that it is not consistent with the prevailing urban property development model and it is considered less than optimal when compared with larger scale, comprehensive redevelopment. In essence, developers typically prefer larger land parcels and a minimum of variety

in construction methods and components, for reasons of efficiency, ease, certainty and management (English Partnerships, 2007). While many recognise the important and growing role of urban conservation and sustainability in development economics (Havard, 2008; Ratcliffe, Stubbs and Keeping, 2008) there remain strong economic grounds to pursue larger scale, comprehensive development in urban areas. Evans (2004, p.175) addresses these grounds and their relationship with land use planning and he concludes that ' … the system will tend to favour the large development and the large developer over the small … ' and that ' … in favouring the large over the small, the system will also have aesthetic consequences, favouring large-scale development over small and uniformity over varied.'

Most developers, who are by nature 'risk averse', also have a preference for larger-scale development with a single use or a limited range of uses as they believe that developments of this kind will achieve greater 'economies of scale' and will ensure that their development is more attractive to funders and investors (Keeping and Shiers, 2004). As discussed in Chapter 2 (section 2.6), difficulties for property finance, development and management are seen as the key disadvantages of mixed-use development (Coupland, 1997).

The current preferences of the property development sector have two major implications for fine urban grain in the urban centre. Firstly, it renders the existing fine urban grain in the urban centre prone to amalgamation to facilitate larger scale sites and developments, through a process of site assembly or consolidation and, secondly, it means that fine urban grain is not chosen as a model for new development or redevelopment. In fact it has been argued by Barton, Guise and Grant (2010, p.262) that the '…greatest threat to plots and the small-scale land uses that they accommodate, has been the comprehensive development area and the associated land assembly, such major developments have often proved to be less adaptable to changing economic climates than the smaller plots.'

Attitudes around urban property development may be changing and a more favourable consideration of fine urban grain may be emerging. There is now a debate around issues of profit and sustainable property development, which centres on current requirements for environmental performance and sustainability that may constitute future environmental savings. The argument is made that smaller scale elements, such as individual buildings and fine urban grain, are not only more

sustainable but can be shown to be more profitable in the longer-term, when they are considered as part of well-functioning, attractive and environmentally-responsive places (Pitts, 2004).

Ultimately, investment and development decisions are based on establishing values and profitability and where coarse grain and larger scale options are available in the urban centre and permitted or even encouraged by Planning Authorities, it is apparent that they are still being chosen.

3.7 Delivery of the fine urban grain

The disposition of the urban property development sector towards fine urban grain is certainly evident in the very limited number of contemporary, small plot developments of any significant scale in the urban centres of Ireland, Britain or Europe. Most contemporary fine urban grain is limited to very modest urban infill, building replacement on existing small plots and demonstration or special projects (e.g. the 'Tutti Frutti'/'House' project in Manchester by Urban Splash shown in Figure 3.3). Recent case examples of contemporary fine urban grain are frequently sourced from new residential neighbourhoods in suburban or peripheral locations, for example, the recent development of Java and Borneo Islands in the Eastern Harbour of Amsterdam (Physical Planning Department, Amsterdam, 2006).

The Friedrichswerder infill redevelopment completed in Berlin between 2001 and 2007, (Figure 3.3) is a rare case example where a substantial development site in the city centre was redeveloped on the basis a detailed master plan, prepared in 1991 (Clelland and Schäche, 2009). The master plan set out a new fine urban grain (pre-war ground plan) of narrow and deep plots and it allowed for a mix of uses between and within buildings, which comprised residential, offices and services. A range of designers was involved in the execution of the development.

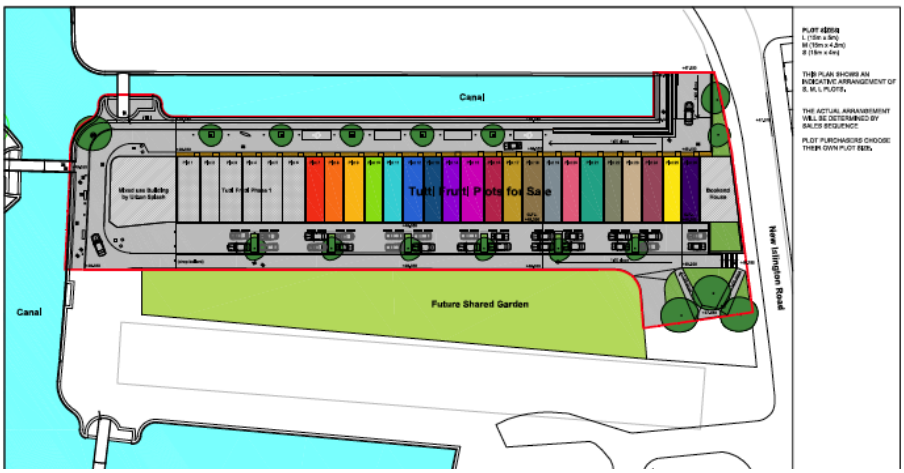


Figure 3.3. Tutti Frutti, New Islington (Urban Splash) (top and middle) (Used with the permission of the author) and the Friedrichswerder infill development in Berlin, 2001-2007 (bottom) (Used in accordance with Google usage rules).

3.8 Summary

This chapter has provided the essential urban context of the urban centre and the practice context for the fine urban grain. It complements Chapter 2, which considers the theoretical context of the fine urban grain, and it completes the overall context for the research. Chapter 4 draws together the elements of both chapters into a conceptual model for this research.

Although the urban centre is the heart and the focus of the sustainable city it has been subject to the profound and damaging processes of decentralisation and suburbanisation. Despite a range of approaches to urban regeneration, key challenges remain and businesses and urban centre activities continue to migrate to the edge of the city. Vitality and viability are the 'umbrella' objectives for the urban centre, and they are reflected in a range of urban policies. These prioritise the urban centre and promote redevelopment, seek greater diversity of uses and activities, better accessibility and public spaces, conservation of heritage and improved partnership and management.

While urban centre policies are framed to support diversity and the objectives of vitality and viability of the urban centre, it is clear that they have potential to conflict in key areas. This is most apparent in the potential conflict between pro-redevelopment policies, which may result in the loss of fine urban grain and policies to retain and enhance diversity of uses and activities. If the claims around fine urban grain and mix of use, ownership and business are shown to be true then the loss of this fabric through pro-redevelopment policies will need to be reassessed to avoid negative outcomes for the diversity of the urban centre and the objectives of vitality and viability.

The planning system has a key bearing on the change and transformation of the urban grain in the urban centre. The planning systems in Britain and Ireland do not regulate the subdivision or amalgamation of the plot as a unit of ownership, however, they do regulate the uses and structures associated with urban grain. Aspects of significance to urban grain include the need for consent for development and the ability to shape proposals by consent conditions, special planning controls such as conservation areas and the protection of buildings and structures.

The local spatial plan provides the greatest potential for protection of fine urban grain in the planning system as it can set out a range of policies and objectives to secure land use and urban form objectives. Unfortunately, there is very little evidence of any detailed consideration of fine urban grain in current planning practice. The planning system has other unused or underutilised mechanisms, which also have the potential to manage the fine urban grain. These include planning agreements and obligations and development and ownership by Local Authorities. Most significantly, there are elements of the planning legislation, which are potentially destructive of fine urban grain such as provisions and policies for site amalgamation and active site identification.

There is an absence of statutory planning guidance for practitioners and developers the urban grain. Current guidance is non-statutory and discretionary in nature. It provides strong endorsements for the fine urban grain, but it is clear that its impact has been limited in practice and most notably in local spatial plans, which at most contain generic references to aspects of urban form rather than explicit objectives to guide development proposals.

The property development sector is an important catalyst of change in the urban form of the urban centre. Urban property development is a process, which has a preference for scale, reflecting larger economies and contexts. Developers and investors also tend towards minimum use mix to ensure ease of finance, development and management. Fine urban grain is not optimal when considered against these objectives and when compared with the larger scale, comprehensive redevelopment alternatives, which are permitted or even encouraged by Planning Authorities.

4 CONCEPTUAL MODEL

4.1 This chapter

This chapter brings together the main elements of Chapters 2 and 3, which dealt with the theoretical, urban and practice context for fine urban grain, into an integrated conceptual model. It presents the purpose of the conceptual model and its importance to the research. It then sets out the main features of the model, such as the boundaries, variables and relationships between variables. The chapter also highlights other potential relationships between variables and uncertainties within the conceptual model. The chapter concludes with an overview of the model and its use in the subsequent stages of the research.

4.2 The purpose of the model

The conceptual model is an important part of 'real world research' where a variety of contexts are often present and need to be simplified and interpreted (Robson, 2011). The purpose of the conceptual model is to guide research by providing a visual representation of the theoretical framework and specific variables of interest in the research (Stanford University, 2015). Maxwell (2013) states that the conceptual model has three main purposes:

- To organise and make sense of the wide range of theory, context and practice;
- To inform the shaping of the research methodology; and
- To provide a framework for the research conclusions and implications.

Maxwell (2013) also suggests that the model can be informed by personal, experiential knowledge of the research area.

The literature review must be completed and the research aims and questions outlined before the conceptual model is prepared. The literature review provides the basic theoretical framework or context and the research aim and questions provide the focus for the model. While models normally focus on linkages between variables, it is also common for them to go beyond cause and effect and explore linkages and feedbacks in a system. It is suggested (Colorado State University, 2015) that a conceptual model should:

- Set out the boundaries of the system being analysed;
- Identify the independent variable;
- Identify the dependent variable/variables;
- Hypothesise the relationship between these;
- Look for linkages and feedback loops within the model;
- Highlight key processes and modifiers which act as 'drivers'; and
- Identify uncertainties, such as relationships, which are well understood or poorly understood/guessed, assumptions in the model and uncertainties about future conditions.

4.2.1 Boundaries of the system

The model is within a notional system, which consists of boundaries within the larger theoretical framework. In this model the boundary of the system surrounds the independent variable and the dependent variables and the hypothesised relationships between them. The system for this model could also be seen to have a spatial or location context – in this case the urban centre. The model allows for inputs into the system and outputs from the system. In this model the urban form is an input and the effects of the relationships between the variables is an output of the model. The outputs affect the concept of diversity and the key objectives for vitality and viability.

4.2.2 The independent variable

The independent or explanatory variable in this research is urban grain. This is the object of the research or the 'artefact' that is under consideration. As discovered in the literature review (Chapter 2, section 2.2), urban grain has two essential conditions; fine and coarse urban grain. Although the literature focuses on fine urban grain, it is important to include coarse urban grain in the model. Changing the independent variable from fine urban grain to coarse urban grain allows the changing effect on the dependent variables to be established, in much the same way as an experiment would. Changing the independent variable also allows for findings to be benchmarked against each other and cause and effect to be confirmed.

4.2.3 The dependent variables

The dependent or response variables in this research are mix of use, mix of ownership and mix of business. These variables are derived from prominent claims in the literature, however, as was established in Chapter 2, some of these are not underpinned by robust evidence and have not been the subject of any level of rigorous testing. Other dependent variables were identified in the literature around

street life and streetscape. However, these were not included for further investigation as they were considered to be robust, underpinned by a range of evidence and the subject of sustained testing and study. Consequently, they do not feature in the conceptual model.

4.2.4 Hypothesised relationships

The model is completed by including the relationships between the variables. These are hypothesised or thought to exist. These relationships are normally shown by arrows connecting the variables, with a single direction if the relationship is as yet unknown or hypothesised and a double direction if the relationship is established or reasonably certain. The model also includes other potential relationships between the three, dependent variables, although there are no claims in the literature for such relationships.

4.2.5 Processes and modifiers

The model is affected by key processes and modifiers. Some of the more influential processes and modifiers act as 'drivers' (Colorado State University, 2015). The processes and modifiers can be derived from the literature review and include:

- The planning process - this provides the regulatory framework at policy and local plan level for the variables. It is influential in protecting or transforming the independent variable (urban grain) through policies, which seek to protect or redevelop urban grain. In relation to the dependent variables, mix of use is strongly influenced by local land use zoning and development management policies for changes of use. Changing planning policy at local level through rezoning or by other local objectives could have an effect on mix of uses and this may feedback to urban grain. For example, a rezoning to larger scale uses, such as industrial or distribution, is likely to trigger a need for larger floorspaces, which may require the amalgamation of the small plots and the transformation of urban grain. Alternatively, business may leave the area in search of more suitable premises.
- Accessibility – this includes access to all modes of transport including walking, cycling, public transport and private car. Accessibility is key to providing footfall to urban centres and it is included as key indicator of the viability of urban centres in current policy (DBIS, 2011; CLG, 2012; DEHLG, 2012a). Changing accessibility could have a significant effect on levels of footfall. For example, improved public transport, such as light rail, will improve accessibility to retail cores and this is likely to increase levels of

footfall. Increased footfall boosts vitality and can have benefits for mix of use, ownership and business.

- Urban quality – this includes quality of the built fabric and quality of public streets and spaces. It includes notions of attractiveness and vitality, which can serve to increase footfall and local investment. Diversity of uses, businesses and attractions is considered an important feature of urban quality (DBIS, 2011). Deterioration or improvement of urban quality could have an impact on the variables. On the other hand improvement, for example, extension of pedestrianisation, is likely to improve footfall and general ambience and this may have benefits for mix of use, ownership and business.
- Macro-economic conditions – these are influential, particularly with regard to mix of business and ownership. Levels of business may be affected by larger economic conditions, which can affect consumer spending in areas such as retail and services. For example, poor macro-economic conditions can lead to declining footfall and sales. This is likely to affect the viability of businesses and can lead to the closures with a consequent increase in levels of vacancy. Increased levels of vacancy can impact on the vitality and viability of areas and will certainly reduce the overall mix of businesses in an area. In addition, it may have an effect on mix of uses as the number of businesses will have declined. It may also be the case that small businesses are particularly vulnerable to changes in the macro-economic context.
- Property development – this process can impact on urban grain and the dependent variables. Preferences for larger footprints through consolidation of small plots (Evans, 2004) can put pressure on fine urban grain and may lead to its loss through redevelopment. Periods of economic growth give rise to development pressure and this may speed up this process of change in urban grain. On the other hand, extended periods of recession could lead to a lack of investment in fine urban grain, which could ultimately result in its loss.

4.3 Key relationships in the model

The key relationships of the model are contained within the system boundary (Shown as a dashed line in the conceptual model, Figure 4.1). Within this the independent and dependent variables in the model and the hypothesised relationships between these are visualised. In accordance with good practice (Stanford University, 2015) this model places the independent variable on the left hand (or input) side of the

model with the dependent variables being located on the right hand (or output) side. The two basic conditions of urban grain (fine urban grain and coarse urban grain) emerge from the urban grain. From this point the hypothesised relationships between fine urban grain and coarse urban grain and the dependent variables are indicated by the connecting arrows.

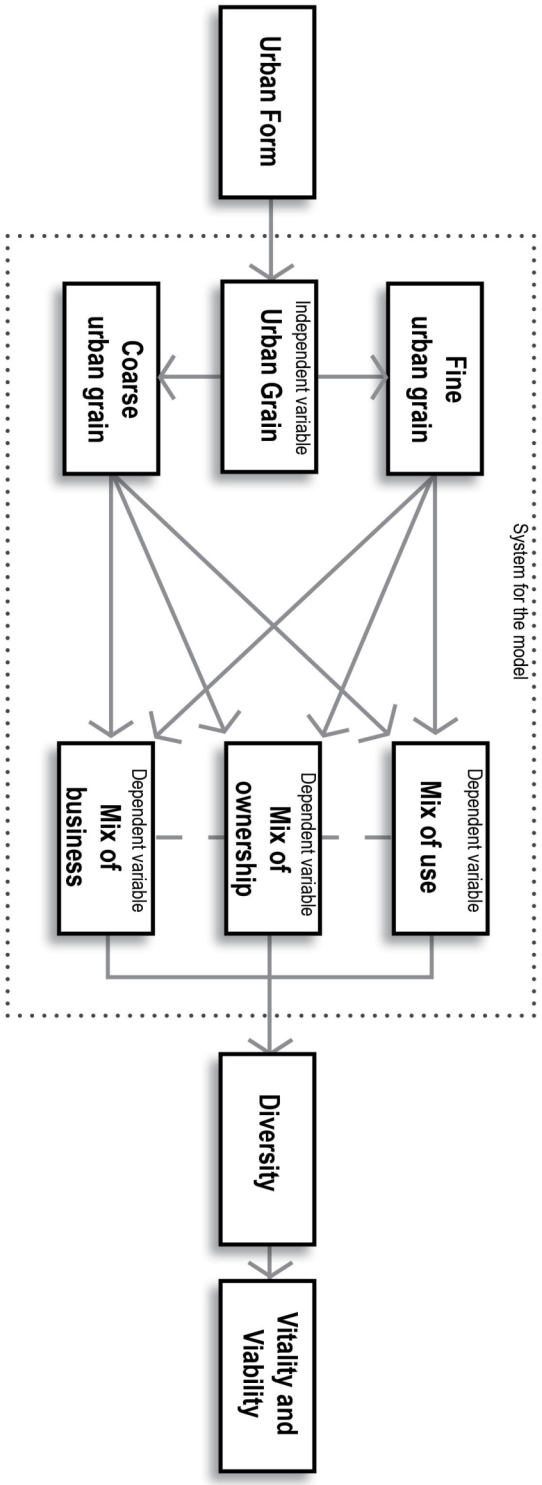


Figure 4.1. The conceptual model.

4.3.1 Urban grain and mix of uses

The academic and professional literature is replete with claims for the benefits of fine urban grain for mixing of uses (DETR, 2000; English Partnerships, 2000). Campbell (2011) suggests that fine urban grain is a pre-requisite to use mixing, while others draw attention to the importance of the mix of uses that fine urban grain brings to the high street (Tarbatt, 2012) and to the regeneration of urban centres (Montgomery, 2003; Pitts, 2004). In essence, the claim is that fine urban grain gives rise to greater mix of use and, it is assumed, greater mix of use than coarse urban grain. The claims are mostly normative and do not have the benefit of an empirical evidence base. In addition, the claim that connects fine urban grain and mix of use has not been systematically tested.

The mechanism or the cause and effect of the relationship is not elaborated on in the literature, although Moudon (1994) suggest that the greater complexity of fine urban grain gives rise to greater complexity in the mix of use. It is likely that the smaller spaces provided by the smaller, multi-floor buildings which characterise fine urban grain are suitable for a wider range of business types than the larger, often single level or double level buildings which dominate coarse urban grain.

The model shows fine urban grain as one of the two conditions or typologies of urban grain and it is treated as the independent variable. The arrow connects fine urban grain with mix of uses, which is treated as one of the three, dependent variables in this research. On the basis of the claims, the hypothesis is that fine urban grain gives rise to high levels of uses mix (and greater mix of use than coarse urban grain). The independent variable is then changed to determine any effect that this may have on the dependent variable of mix of use. The model shows coarse urban grain as the independent variable and it is again connected to mix of use. This relationship is also untested and hypothetical. Accordingly, the hypothesis is that coarse urban grain gives rise to low levels of mix of use (and lower mix of use than coarse urban grain).

4.3.2 Urban grain and mix of ownership

A significant claim in the literature is that fine urban grain provides benefits for mix of ownership (Robson and Pace, 1983; Montgomery, 2003) and is necessary in securing mix of business ownership (McNeill, 2011). Jacobs (1993) suggests that this mix of ownership, provided by local independent ownership is essential in bringing stability and continuity to the local economy. Montgomery (2003) suggests that fine urban grain provides the mix of ownership necessary for the cultural regeneration of

centres. In essence, the claim is that fine urban grain gives rise to greater mix of ownership and, it is assumed, greater mix of ownership than coarse urban grain. As with urban grain and mix of use, the claim is often normative and does not have the benefit of an empirical evidence base. In addition, the claim has not been tested.

McNeill (2003) explores the cause and effect of the relationship and he suggests that the small spaces that small businesses require and can afford are available in fine urban grain in the city centre and that these businesses tend to be independently-owned. Thus the preponderance of independent ownership delivers mix of ownership.

Again, the model treats fine urban grain and coarse urban grain as the independent variables. An arrow connects fine urban grain with mix of ownership, which is the second of the three, dependent variables in this research. As this relationship is untested it is treated as hypothetical. On the basis of the claims, the hypothesis is that fine urban grain gives rise to high levels of mix of ownership (and greater mix of ownership than coarse urban grain). The independent variable is then changed to coarse urban grain to determine any effect that this may have on the dependent variable of mix of ownership. As this relationship is also untested, the relationship is hypothetical and the hypothesis is that coarse urban grain gives rise to low levels of mix of ownership (and lower mix of ownership than coarse urban grain).

4.3.3 Urban grain and mix of business

A significant claim in the literature is that fine urban grain gives rise to greater mix of business and, it is assumed, greater mix of business than coarse urban grain (Robson and Pace, 1983; Montgomery, 2003). The claim has a number of aspects, firstly, that it provides for a greater density of businesses, secondly, that it provides for a greater density of evening uses and, thirdly, that it produces better local business relationships. Robson and Pace (1983) showed that coarse urban grain, produced through comprehensive redevelopment in the urban centre, resulted in considerably lower density of business activity than the traditional mixed-use areas of cities. McNeill (2011) also suggests that fine urban grain provides for a greater range of businesses, in particular evening uses, in city centres. Montgomery (2003) claims that fine urban grain gives rise to enhanced local business relationships, while Jacobs (1993) suggests that greater business continuity from urban grain. In terms of evidence, the work of Robson and Pace (1983) is now dated and in need of updating and it did not specifically target fine urban grain but traditional areas of mixed-use

character. The other aspects of the claim are normative and do not have the benefit of a proper evidence base. In addition, these aspects of the claim have not been tested.

The literature outlines aspects of the cause and effect in this relationship. It suggests that fine urban grain provides the range of small floorspaces necessary to accommodate smaller businesses and that these smaller businesses are likely to be independently-owned. It is added that these small independent businesses are necessary to provide evening uses. In terms of better local business relationships it is suggested that smaller independent businesses have a greater need and desire than large businesses to build relationships with other small local businesses to take advantages of the benefit of agglomeration and association.

The model treats fine urban grain and coarse urban grain as the independent variables. The arrow connects fine urban grain with mix of business, which is the third of the three, dependent variables in this research. As this relationship is untested it is treated as hypothetical. On the basis of the claim, the hypothesis is that fine urban grain gives rise to high levels of mix of business (and greater mix of business than coarse urban grain). The independent variable is then changed to coarse urban grain to determine any effect that this may have on the dependent variable of mix of ownership. As this relationship is also untested, the relationship is hypothetical and the hypothesis is that coarse urban grain gives rise to low levels of mix of ownership (and lower mix of ownership than coarse urban grain).

4.3.4 Other relationships

Although the purpose of the research is not to investigate other relationships between dependent variables, it is, nonetheless, important to consider them as they may have an influence on the outputs. The model shows possible, unknown links between the dependent variables (indicated by a dashed line). There are possible relationships between:

- Mix of uses and the mix of ownership;
- Mix of uses and mix of business; and
- Mix of ownership and mix of business.

There is an extensive literature around mix of use and its range of benefits (e.g. Coupland 1997; Cooper *et al.*, 2009). However, mix of ownership does not feature in this and there is no claim seeking to connect the two. Additionally, a relationship between these two variables would be hard to establish as it would be very difficult to

determine cause and effect. There might, however, be a feedback loop between the two variables, with one reinforcing the other. The same applies to a possible relationship between mix of uses and mix of business. In this case the literature makes a connection between mix of uses and diversity and vitality, but there is no specific claim in the literature connecting the variables of mix of uses and mix of business. Again, cause and effect is hard to attribute in this potential relationship and it might also be a case of a feedback loop.

There is likely to be a link between mix of ownership and mix of business, although there is no direct claim in the literature for this. Montgomery (2003) highlights the relationship between these two variables and fine-grained areas and Jacobs (1993) links local ownership with richness of business. It seems common sense to assume that a mix of business will give rise to a mix of ownerships, given that increased business density is likely to result in many smaller businesses, rather than fewer, larger businesses. And it is assumed that many small businesses will be independently-owned, as inferred by the literature. In terms of cause and effect it is likely that greater mix of business gives rise to greater ownership mix (measured by the proportion of independently-owned businesses).

4.3.5 Diversity, vitality and viability

The model shows diversity at the output side of the model. Importantly, the output side shows the connection of the relationships within the model to larger societal goals and objectives. Notably, it shows the established relationship between diversity and the key objectives of vitality and viability of the urban centre. The more general relationships between diversity, vitality and viability and larger philosophies such as sustainable development and urban quality are not shown in this model but are discussed in broad terms in Chapters 2 and 3.

4.4 Uncertainties

The drivers and modifiers will have an effect on the variables in the model. For example, drivers such as macro-economics and accessibility will have impacts on footfall, which are likely to impact on mix of use, business and ownership. It is also clear that a change in drivers such as planning policy and property development could impact on urban grain. The nature and extent of that effect is difficult to predict and it is necessary to design a research methodology, which is capable of factoring in these processes and drivers so that they can be understood and managed.

Overall, the causal factors for the relationships are poorly set out in the literature. In most cases, rhetorical arguments are made in support of the claims and causal factors are not explained in any detail. To counter this, the author's experiential knowledge of the research area has been mined, as recommended by Maxwell (2013). No claims are included in the literature for causal relationships between the dependent variables. A possible relationship between these cannot be excluded, however, cause and effect of relationships is difficult to establish and relationships may be more akin to feedback loops.

4.5 Conclusion

This chapter has outlined a conceptual model for the research. It is based on an in-depth analysis and reflection on the literature review and the overall research aim and research questions. The model has also drawn from the experiential knowledge of the author. The model appears to be robust as it satisfies Goes' (2002) criteria for conceptual models in that:

- It contains no spurious or 'third' variable – all variables appear to be relevant to the system;
- All relationships appear to be defensible – the literature and experiential knowledge support them;
- It contains variables which have the freedom to vary – the mix of use, ownership and business are clearly variable and urban grain can be either fine or coarse;
- A likely causality can be established for each relationship; and
- It does not cross spatial scales or levels of analysis, and the level of analysis is the same as the level of the hypothesis and conclusion.

In summary, the conceptual model provides a clear visual representation of the conceptual system within the larger theoretical framework and it highlights specific variables of interest within the research aim and questions (Stanford University, 2015). The model also provides a clear framework for the research design and the conclusions and recommendations of the research.

5 RESEARCH METHODOLOGY

5.1 Introduction

The purpose of this chapter is to set out the methodology for the research. This chapter comprises two main elements. The first element includes the research philosophy, the research strategy and research techniques for data collection and analysis. The second element is an introduction to the two case study areas. This provides an outline of the location, historical development, urban form, land use, accessibility and planning context for each area.

As discussed in the literature review, the theory in this area connects fine urban grain and the key variables of mix of use, ownership and business. This connection has not, however, been underpinned by robust evidence or been the subject of testing. For this reason the connections between these variables and fine urban grain are considered as 'claims'. These claims are, nevertheless, significant as each asserts a key role in securing diversity, which is an important component of the key planning objectives of vitality and viability of the urban centre. The research design is based on an understanding of this theoretical framework and the conceptual model provided for the research in Chapter 4 (section 4.3).

5.2 Research aim and objectives

The overall aim of the research and the research objectives drive the research design process. In particular, the approach of the research and the methods and techniques employed need to match the objectives of the research. The overall aim of this research is to determine the effects of urban grain on the diversity of the urban centre. In order to achieve this aim, the research has been structured around five research objectives. These are:

i. To establish a clear understanding of the terms, concepts and claims around urban grain in the urban centre;
ii. To establish the relevant theoretical, urban and planning policy context for the urban centre;

iii. To develop and implement a research methodology for investigating key claims around mix of use, ownership and business for fine urban grain in the urban centre;
iv. To critically analyse and interpret the findings of the research and their implications for the current theory; and
v. To provide policy and practice recommendations for urban grain in the urban centre.

5.3 Research design

Research design is normally carried out with reference to accepted models and sources. These usually consist of a hierarchy, which includes research philosophy, research approach or strategy and research techniques or tactics (Groat and Wang, 2002; Creswell, 2002; Robson, 2011) (Figure 5.1). This is a useful structure on which to formulate and describe the research design for this research.

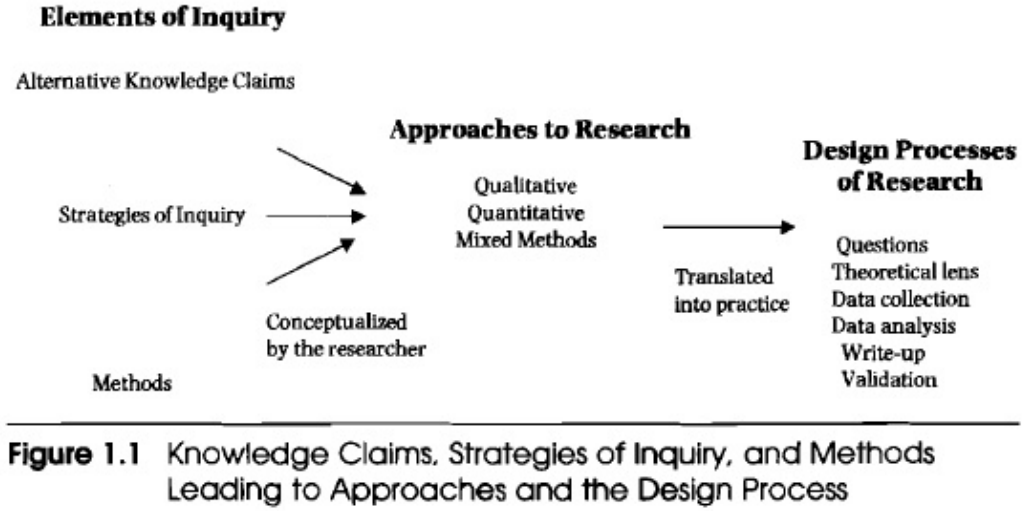


Figure 1.1 Knowledge Claims, Strategies of Inquiry, and Methods Leading to Approaches and the Design Process

Figure 5.1. A typical research design process (Creswell, 2002). (Used with the permission of the publisher).

5.3.1 Research philosophy

All research is carried out from a basic philosophical stance or 'system of enquiry' (Groat and Wang, 2003). Individual researchers can hold different philosophies depending on their background and their perspectives and there are numerous such philosophies identified in the literature, including pragmatism and interpretivism (Saunders, Lewis and Thornhill, 2012), feminism and post-modernism (Crotty, 1988). Robson (2011) describes just two basic, often opposing, research philosophies –

positivism and relativism, and the middle ground between them. Positivism was long considered the standard view of research with its scientific approach and emphasis on clear methods and fixed, quantitative methods that are often applied to smaller and more straight-forward inquiries. Relativism, in contrast, provides a critique of the standard view from a social research perspective noting that social phenomena are not 'out there', but in the minds of people and their actions. In this sense, relativism is more about understanding the meaning of experience and behaviour in practice. While it sees a role for quantitative methods, it emphasises qualitative research, emerging concepts and working hypotheses.

Robson (2011; p.4) presents critical realism as the middle ground or the balance between these systems of inquiry and one that is most suited to the 'real world', a place he describes as being '…a complex, relatively poorly controlled and generally messy situation.' This perspective recognises the importance of the larger context and the complexities and stratification of the real world. It is also a system where knowledge is considered as being a social and historical product and where there is a focus on mechanisms, laws and characteristic patterns. Importantly, this system of inquiry requires that researchers have a very substantial knowledge of a phenomenon before experiment and that they gain understanding about mechanisms through theory and observation. This system also encourages integration of subjective and objective approaches and it is critical in the sense that it may criticise the practices that it studies. It was clear that this research should be approached within the sphere of 'critical realism' and real world research.

5.3.2 Research strategy

Groat and Wang (2002) describe strategy as the 'skilful management' of the research. There are many ways to conduct research and the choice of strategy is driven by the nature and characteristics of the research question or aims (Robson, 2011). There is a need, however, to consider some of the basic underpinnings of research strategy and how theory should be investigated and tested.

In essence, theory is the connection or the cause and effect between two or more variables and Robson (2011: p.61) describes good theory as ' … an explanation of what is going on in the situation, phenomenon or whatever that we are investigating.' In investigating theory an inductive or deductive approach can be adopted. An inductive approach involves the investigation of an area of theory to determine connections, or causes and effects, between as yet unknown variables and then fixing

the research hypothesis. In contrast, a deductive approach is where the variables in the theory are known and where a hypothesis is established at the outset. The deductive approach was seen as the most appropriate to this research given that the variables in theory were known at the outset. Additionally, Creswell (2002) advises that if the literature in the area is well developed and if it possible to construct a theoretical framework from it, which is the case in this research, then it is amenable to deductive research.

It was also important to consider the basic purpose of the research when formulating the strategy. Lawrence (1997) suggests that research may have one or more purposes including exploratory, such as uncovering new insights, descriptive, such as creating accurate profiles, and explanatory, such as explaining a situation or problem. Robson (2011) uses the same categories but also includes emancipatory purpose, which is engaging in social action. Both exploratory and explanatory aspects were appropriate to the research aim and objectives of this research.

As already stated, there are different research strategies available to the researcher. While a division between quantitative and qualitative strategies is often suggested, Yin (2009), for example, takes a different view and includes four basic research strategies; experiment, survey, case study and archival analysis, with the possibility of using more than one such strategy. Groat and Wang (2002) list seven research strategies of particular relevance to urban design and architecture; interpretive-historical, qualitative, correlational, experimental and quasi-experimental, simulation and modelling, logical argumentation, and case studies and combined strategies.

The descriptions of strategy options can be confusing as some might also be considered as techniques or tactics in their own right (for example, survey, simulation or modelling), particularly where they are used in conjunction with other techniques as part of a combined strategy. In the case of this research it was clear that the case study approach was of greatest utility, however, there were other elements, such as survey and correlational research which were important in establishing the relationship between the variables in the theory and could be deployed as techniques within the case study strategy.

Groat and Wang (2002; p.94) neatly describe the case study as a ‘conceptual container’ which can be a research strategy comprising a range of techniques, or a

smaller technique or tactic within a strategy. They highlight the value of comparing case studies within research to provide a general set of observations, which can also be illustrative of larger abstract principles. They also highlight the importance of case study in demonstrating the principles of sustainable design.

The case study strategy had many other benefits for this research. As stated by Yin (2009) cases study is able to tell a story within a well-known context for the researcher. And importantly, the case study can draw on different, known sources of information, which can allow for corroboration of evidence using a range of different quantitative and qualitative techniques (for example, archives, land use survey and questionnaires). An important consideration for choosing the case study strategy for this research was the ability to clearly identify and bound the study areas in the urban context (Simons, 2009).

A final consideration in formulating the research strategy is the time horizon. Saunders, Lewis and Thornhill (2012) suggest that a 'snapshot' or cross-sectional approach, rather than a longitudinal approach (over a particular time sequence), is the most appropriate for case study research and surveys, where the research is undertaken to answer a question or address a problem at a particular time. Cross-section is also suggested by Yin (2009) as appropriate for survey and case study when considering the relevance of research strategies. Accordingly, the cross-sectional time horizon was chosen for this research strategy.

5.3.3 Case study design

Detailed design followed the choice of strategy. The detailed design of the case studies involved defining the variables under consideration, the choice of one or multiple case studies, the choice of case study areas, data sources and the range of techniques for data collection and data analysis.

5.3.3.1 Unit of investigation

At the outset, as recommended by Proverbs and Gameson (2008), it was important to define 'the unit of investigation', or the object that was at the centre of the research, and 'the phenomena' associated with the unit of investigation. In this research the unit of investigation was the urban centre and the phenomena were the variables established in conceptual model for this research (Chapter 4), being urban grain and the key claims made for fine urban grain around benefits for mix of use, ownership and business.

5.3.3.2 One or multiple case studies?

A key decision in the case study strategy was the choice of one or multiple case studies. It is argued that the single case study is often within the resources of the single researcher and that it can include a very detailed and in-depth study within representative or distinctive contexts (Yin, 2009). In support of multiple case studies, it is argued that results would be more compelling and could be more widely applied, assuming that they defended each other (Stake, 1995; Proverbs and Gameson, 2008). Groat and Wang (2002), also highlight the particular utility of two or more case studies for comparative analysis.

Having considered resources and the research aim and questions, it was decided to take two case study areas. An additional consideration was that there was a real need to 'benchmark' the performance of fine urban grain against the other (coarser) typology of urban grain, as there were few, if any, benchmarks available in the literature for urban grain or the claims. This indicated that two case study areas of contrasting urban grain should be chosen to determine if the fine urban grain performed better, on an area-wide basis, than the coarse urban grain against the variables of mix of use, mix of ownership and mix of business. Additionally, the case studies needed to address other variables, which might impact on the mix of use, ownership and business.

5.3.3.3 Choosing the case study areas

A mixed scanning approach, which is a hierarchical mode of survey and analysis (Etzioni, 1986), was used in the search for case study areas. It provided both a broad overview of potential urban locations and a more detailed review of prospective case study areas. The approach was based on the following set of criteria:

- Established geographical, statutory and policy boundaries;
- The same overarching planning policy with clear designations;
- Comparable overall urban function, location, urban scale and accessibility for all modes of transport (to limit the potential impact of these variables on the research findings);
- Contrasting typologies of urban grain (i.e. mainly fine urban grain and mainly coarse urban grain);
- Similar land area;
- A range of consistent and reliable baseline data; and
- Accessibility to the researcher.

On completion of the scanning process, the two long-established and independent retail cores of Dublin city centre (the Grafton Street area and the Henry Street area shopping cores) were chosen as they fulfilled all of the criteria. Both case studies are described in greater detail in sections 5.5 and 5.6 of this chapter.

5.3.3.4 Data sources

In line with best practice, a range of sources for data were mined for the case studies (Yin, 2009; Robson, 2011) including:

- Base mapping, which was received in digital and hard copy format from Ordnance Survey Ireland and Dublin City Council;
- Documentary data (such as local plans and studies);
- Archival records (such as previous surveys, planning applications and small area statistics);
- Social surveys (online and face-to-face questionnaires relating to local business); and
- Land use, ownership and business surveys.

5.3.4 Case study surveys

As discussed in the literature review, the claims for the benefits of fine urban grain centre on the concept of diversity, which is a central feature of urban theory and planning policy for the urban centre. In addressing these claims it was clear that in-depth study surveys would be required around mix of use, ownership and business, given the lack of existing data. It was also clear that an element of social survey would be required to gather data on business relationships. The first element of the survey established the nature of the urban grain in both areas (in accordance with the definition established in the literature review). This was essential in objectively describing the urban grain in the study areas. The second element was a plot-by-plot and floor-by-floor survey of land use, ownership and business in both study areas. The third survey was a social survey of business relationships. This survey was based on a sample of businesses in both areas. The surveys are described in more detail in the following sections of this chapter.

The surveys were prepared using the accepted convention of design, test and redesign Robson, 2011). Each survey was detailed in a preliminary design and was followed by pilot-testing. In some cases changes were made to the survey techniques when they were found to be unworkable or unfeasible. One such case was the land use,

ownership and business survey where other sources of information were used to improve the accuracy of the external building surveys. This involved internet searches for business websites to confirm the presence and location of land uses and business. Table 5.1 provides an outline of the survey elements, techniques and analysis for the principal claims.

Survey element	Techniques	Analysis	For claim
Urban grain	Identification of the urban plot on digital base maps.	Calculation of density of plots by case study area and block. Rasterisation of vector base map to provide intensity analysis.	None. Establishes an objective framework for measuring the urban grain in both case study areas.
Land use, ownership and business	Door-to-door land use, ownership and business location survey on base map. Mapping of point data for business location and evening uses.	Rasterisation of land use and ownership mix vector data. Overlaying of mix of use on urban grain and statistical analysis. Overlaying of ownership mix on urban grain and statistical analysis. Statistical analysis of evening uses and urban grain.	Benefits for mix of use. Benefits for mix of ownership. Benefits for mix of businesses.
Business relationships	On-line and door-to-door questionnaire of sampled local businesses.	Basic statistical reporting of the data.	Benefits for local business relationships.

Table 5.1. Overview of the surveys.

5.3.4.1 Use of GIS

GIS was chosen as the principal framework for collection and analysis of the data as it is an established and powerful tool and method for the management and evaluation of spatial and environmental data in support of land use planning (Wilson, 2013).

GIS also provides the ability to generate new information by integrating existing and diverse datasets, which share a compatible spatial referencing system (Dai *et al.*, 2000). There is no single, step-by-step approach to GIS analysis, rather each research must be based on a unique and bespoke approach, which must be related to the research questions. In this research the approach took the following stages as recommended by Wilson (2013):

- Conceptualisation – considering the role and extent of GIS in the research;
- Formalisation – identifying data, method and system constraints, including the scale of measurement and expression of the data;
- Operationalisation – selection of variables to be measured;
- Observation – in this case the collection of the survey data and decisions on the format of the data or the need to transform data; and
- Analysis – making sense of the information and using the appropriate level of spatial analysis (in this research overlaying and intersections).

The representation of the data (maps and legends) was an important element of the approach, which required careful consideration. ArcGIS, a current industry-standard version of GIS software, was used for all GIS operations and analysis.

5.3.5 Data collection and collation

The following sections outline the key aspects of the data collection and collation process. These were; preparing the base map, designing and carrying out the surveys and the collation of the material in a systematic and consistent way. This was crucial in managing the diverse and large datasets in this research.

5.3.5.1 Base map

Having defined the case study areas and their boundaries, it was important to find a reliable base map or 'base layer' for the primary research. This was the current Ordnance Survey Ireland digital vector map for Dublin City Centre (which comprised a number of tiles in binary DWG format). It was supplied by Dublin City Council. The base map included standard geo-referencing based on the primary Irish mapping projection system. The base map was stripped and trimmed to include only relevant map detail and the immediate surroundings of the study areas.

5.3.5.2 Survey of urban grain

Urban grain was the first element of the survey to be carried out in the study areas. The literature review provided a good definition for the urban plot as an element of

the urban from, as being the physical extent of discrete and spatially-independent parcels of land within urban blocks. On review of the digital base map it was found that what appeared in some cases to be urban plots were in fact minor, ground floor subdivisions representing postal addresses rather than spatially distinct plots. This 'raw' mapping would have provided a misleading picture of the urban grain. Therefore, a site survey was carried out to establish the 'true' plots within both study areas. This was supported by reference to aerial photographs. The digital base map was duly amended to provide a final base map of the urban grain.

5.3.5.3 Survey of land use

The land use survey was carried out to gather data to test the claim that fine urban grain provides greater levels of mix of use. To do this comprehensively it was decided to look at land use for all buildings and all building floors. There were no recent or detailed databases of land use for Dublin City Centre. As such, a full land use survey was carried out for the research. The survey was carried out in 2013 and covered both study areas, which totalled 22.0 hectares and 854 individual buildings.

In accordance with best practice, the greatest level of detail was targeted within the available resources (ODPM, 2006). In this research, the land use data were recorded to the level of the principal land use of each level. A land use was recorded in all instances, although internal access was not normally available. As a result some element of error was inevitable and in order to reduce this, secondary sources, such as websites and property rates registers, were consulted where a use was initially considered inconclusive.

Historical land use data from 2000 were sourced from Dublin City Council. Unfortunately, this was a very partial record as it recorded ground floor uses only and even this record was found to be incomplete in some locations. A more generalised study of land use was carried out for Dublin City Business Improvement District (BID) in 2011 for its functional area in Dublin city centre and this provided useful context (Keane, Doyle and Gocur, 2011).

The land use categories were based on the standard Dublin City Council land use classification system, which was used in successive land use surveys. There are 10 top-level land use categories present in the study areas (from a possible 13 categories in the system) as follows:

- Residential;
- Retail;
- Services;
- Storage;
- Professional;
- Car park;
- Education;
- Community;
- Miscellaneous; and
- Vacant.

Vacancy, although not strictly a land use, but a very important condition, was recorded in this system. In line with common practice, land use data were collected at the more detailed level of sub-category (for example, particular types of retail such as footwear, clothing etc.).

Recording land use in coarse urban grain, multi-use blocks (for example, the enclosed ILAC Shopping Centre, with a mall, small shops and department stores) presented some difficulties. In these buildings, the base mapping did not provide the internal unit footprints necessary to accurately locate different land uses. Previous land use surveys (for example, for the Dublin City Council survey in 2000) treated shopping centres and department stores as a single, principal use. However, it was felt that this had the effect of simplifying land use patterns in the area.

As the intention was to provide the most accurate picture of land use possible within the available resources, the land use survey included the internal land uses of shopping centres and malls where clear physical sub-divisions could be established. Department stores do not have physical sub-division separating their range of uses and activities and they were treated as single uses in the land use survey. The inclusion of the internal layouts required the input of new data into the digital base mapping. As this was not available from normal digital mapping sources, it was derived from scaled floorplans submitted to Dublin City Council for planning permission.

The output of the land use survey was a layer of mapped vector data, provided for each level in each study area. These spatial data were linked to data spreadsheets (GIS and Excel). This data layer was then suitable for rasterisation and in-depth land use analysis.

5.3.5.4 Survey of ownership

The second element of the survey was ownership. The ownership survey was designed to gather data to test the claim that fine urban grain provided for greater mix of business ownership and, in particular, independently-owned business ownership. The literature in this area refers solely to proprietary business ownerships and not to property ownership in the legal sense. As there were no existing databases of ownership for the area, a full survey of business in the area was also required.

Principal business ownership was recorded for ground floor and the combined upper floors. Although vacancy was recorded, it was not intended to include it in this aspect of analysis (as it was already recorded under the land use survey). Non-commercial ownership, such as residential, was not recorded in the survey as it was not relevant to the claim and it was, in any event, extremely difficult to ascertain. The decision was taken to provide the most accurate picture of ownership possible within the available resources. Accordingly, it was recorded in the same manner as land use and included the ownership pattern within the internal units of the shopping centres and malls. The output of the ownership survey was a layer of mapped vector data for the ground floor and the combined upper floors of the study areas. These spatial data were linked to data spreadsheets (in GIS and Excel). The data layers were then suitable for rasterisation and in-depth analysis.

5.3.5.5 Survey of business

The third element of the survey recorded the presence of distinct businesses in the study areas as the density of individual businesses and evening uses was considered to provide a good indication of business diversity. These data were distinct from the land use data as they focused on the finer detail of business activity in both study areas. For example, it was possible that two or three businesses within the same land use category could have been recorded on the same floor of an individual building.

Each individual business was recorded as a point on the base map as it was not possible to provide an accurate location or footprint for each individual business. The output of the business survey was a layer of mapped point data, located at the

appropriate business address. Approximate locations were provided for businesses in shopping centres. These spatial data were linked to data spreadsheets (in GIS and Excel). In addition, the total number of businesses in each individual urban block in both study areas was recorded.

The fourth element of the survey recorded the evening uses in both study areas. These data were gathered to test the claim that fine urban grain was necessary in providing for the businesses and activities of the evening economy. While there is no standard time range for evening uses, it can be described as being outside of normal business hours. It was observed in the survey that extended retail business hours reached 8.30PM on some evenings. Therefore, evening or night-time uses were considered to be those which remained open on most days beyond 8.30PM.

Each evening use was recorded as a point on the map as it was not possible to provide an accurate location or footprint for each individual, evening use. The output of the evening economy survey is a layer of mapped point data, located at the appropriate business address. These spatial data are linked to data spreadsheets (in GIS and Excel).

The final element of the survey was a sample of local businesses to consider the claim that fine urban grain provided better local business relationships. This was necessary as no data were available around this claim and it is not an area in which data are normally collected or retained. The survey was based on a non-probabilistic, strata sampling technique. A range of business sizes was targeted in both fine and coarse urban grain. An effort was made to achieve a rough balance between the number of premises surveyed in both study areas. It was aimed to get responses from most streets. Responses from a range of different activities within the main land use categories were sought. The author's knowledge of the study areas was used to limit bias in selection of respondents. A short questionnaire was prepared that included questions on:

- The regularity of interaction with other local businesses. This was included as it is a measure of the nature of relationships between local businesses. The question sought responses which might point to any difference between the nature of relationships between smaller businesses in fine urban grain and larger businesses in coarse urban grain;

- Membership and engagement with a local representative group. This is a measure of the involvement of businesses in the local group activities. The question sought responses which might point to any difference in the level of involvement of businesses in the local group activities between smaller businesses in fine urban grain and larger businesses in the coarse urban grain; and
- Years in operation. This is an indicator of the robustness of business. The question sought responses, which might point to any difference in the length of operation between smaller businesses in fine urban grain and larger businesses in the coarse urban grain.

Dublin BID acted as 'gatekeeper' for the survey, circulating the questionnaire to its membership and providing introductions for the face-to-face interviews. The survey was initially sent by email to 380 businesses (There were approximately 549 businesses in both study areas). Responses were initially collected using Survey Monkey on the understanding of confidentiality. A low response rate was achieved using this method, so the survey was continued on a door-to-door basis.

5.3.6 Analysis of the data

The following sections outline the key aspects of the analysis process, which followed the survey stage. Each claim was analysed separately using techniques most suited to the inquiry. As most urban centres contain some element of mix of urban grain within their boundaries, it was also important to compare and contrast the performance of fine and coarse urban grain within the boundaries of each case study.

5.3.6.1 Analysis of urban grain

As discovered in the literature review, there was no established method to objectively map or analyse urban grain. It was also found that this is not an uncommon problem in the study of urban form, particularly at the local level (Song *et al.*, 2013). As a result it was necessary to develop bespoke urban design measures from local studies, rather than drawing solely from generic metrics. This approach is supported by Clifton *et al.* (2008, p.34) who suggest that local urban design measures should also be ' … collected through field observation or interviews.'

In the absence of an established method for measuring and generalising urban grain, a number of other techniques in related areas were considered (These are outlined in

more detail in Chapter 2). Of these, the following two approaches to analysis were considered most appropriate for this research:

- A density-based approach; and
- A grid-based approach.

5.3.6.2 Density-based approach

Using the density-based approach, gross density figures were calculated for the overall case study areas and for each block within the case study areas. Mapping was then produced identifying and numbering individual blocks in each study area. The land area and the number of plots were established for each block and the number of plots per hectare was calculated. Higher values per hectare were indicative of finer urban grain and lower values indicative of coarser urban grain. Using this technique it was possible to compare the urban grain of both study areas and the urban grain of the individual urban blocks within both study areas.

5.3.6.3 Grid-based approach

The grid-based approach allowed the measurement the 'fineness' or 'coarseness' of urban grain, a key feature given the mixed urban grain of most urban centres. Additionally, it allowed for direct comparison with other urban areas, subject to use of the same grid parameters. While the grid-based approach was common in other related studies, it has not, to the author's knowledge, been used in any professional or academic context to measure urban grain.

The grid-based approach depends on the transformation of spatial data (the survey base map) from normal vector format to raster format, through a process of rasterisation. As discussed in Chapter 2 (section 2.4), rasters store data in a two-dimensional matrix of uniform grid cells, which have a single value. The cell is homogenous and incapable of providing information at any finer resolution. The size of the grid is crucial in grid-based analysis, as grid size can vary greatly from project to project and can greatly affect outcomes. Ultimately, the choice is a response to the nature and complexity of the area under study, the resolution or detail of the information available and the design and expected outcomes of the research itself (Dai *et al.*, 2001). Relevant precedents indicated the suitability of the 20m by 20m grid cell (Longley and Mesev, 2000; Pauleit, Ennos and Golding, 2005; Bordoloi *et al.*, 2013). This grid was adopted and a standard matrix of geo-referenced cells was created using the 'fishnet' function in ArcGIS.

5.3.6.4 Spatial analysis

Choosing the correct level and depth of spatial analysis was crucial in responding to the research questions. Overlaying, an advanced level of spatial analysis, was chosen as it was the most appropriate and common analysis technique used to examine relationships between different spatial data (Malczewski, 2004; Wilson, 2014). Buffering, another advanced spatial analysis technique was not considered appropriate as it is concerned mainly with the analysis of proximities.

Overlaying allows multiple layers of data to be integrated (Dai *et al.*, 2001). Importantly, different data formats (such as raster, vector and point) can be layered, although it is normal, where possible, to harmonise these data formats. In this research, rasterisation allowed for harmonisation of key layers of data (such as urban grain and land use). However, business location data were contained on a 'point layer' as they could only be 'pin-pointed' in the survey.

As the analysis was designed to measure intensity rather than proximity, values represented the number of intersections (the number of urban plots and or parts of plots) observed in each cell. The values were presented on a basic scale – for example, one plot or a part of a plot in a cell gave a value of 1 and two plots or two parts of a plot in a cell gave a value of 2, and so on. The higher the value, the finer the urban grain and the lower the value, the coarser the urban grain. 'Heat mapping' was then generated using deepening tones to represent levels of intensity. The cells were geo-referenced and linked to data spreadsheets (GIS and Excel). The raster provided a simplified, objective and powerful representation of the spatial distribution of urban grain in the study areas. Finally, mean cell values for each study area were calculated to provide a general picture and broad comparison of the urban grain in both study areas. The mean value for each study area was calculated by dividing the sum of all the cell values by the total number of cells in the study area.

5.3.6.5 Analysis of mix of use

As discussed in Chapter 2 (section 2.4), a substantial amount of research has been done in recent years on the analysis of land use mix at the city scale. Different techniques have emerged to conceptualise land use mix in the 'real world'. They have evolved from very basis techniques to more sophisticated models, which can be categorised as being concerned with accessibility (or proximity of land use to each

other), intensity (magnitude) or distribution (geographical location) (Song and Rodriguez, 2005).

The most basic aspect of the land use analysis in this research was the land use profile, a common technique in practice. This was carried out using descriptive statistics (e.g. pie charts), which provided basic breakdowns of land use categories. As the data were also collected on a floor-by-floor basis, vertical land use profiles were also carried out. Land Use Frequency (LUF), a basic technique for analysis of land use mix, was then used to record the number of land use categories in the study areas out of the possible full range of land use categories. This provided a very crude measure of land use mix and it was used in this analysis to provide simple, comparative measurements between study areas.

Basic Land Use Mix (LUM) techniques were then used to describe the degree of mixing in the case study areas. LUM is normally based on an entropy model and it measures the degree of homogeneity or heterogeneity of land uses present in an area. The LUM model used in this analysis was as follows:

$$Entropy = \sum_j P_j \times \frac{\ln(P_j)}{\ln(J)}$$

Where:

Pj = the proportion of total of jth land use category found in the area being analysed; and

J = total land uses considered in the study area.

Values for LUM are nomalised and lie within the range of 0 and 1. A value of 0 represents complete homogeneity of land use and a value of 1 represents completely heterogeneity of land uses or equal distribution of all land use categories within the area. While this model is useful in providing comparisons between areas (and other benchmark studies) and is suited to relatively small geographical areas (Ma and Chen, 2013), it does not consider the spatial patterns of land uses within defined areas. Additionally, LUM does not provide detail on the magnitude of each type of use in the area and the same values can be returned for very different types of mix of use (Song and Rodriguez, 2005).

A range of other models has been developed to provide a more sophisticated representation of land use mix, including the diversity or mix indices (such as the Dissimilarity Index). These use a grid cell approach to analyse the dissimilarity of the uses in adjoining cells. They are considered to provide a more accurate picture of use mix than the entropy model (Ma and Chen, 2013, p.13) as they use ' …finer-grain cells (raster data information) rather than parcels lots (vector data format) as the unit of analysis.' More recently, a Mix Type Index (MTI) was proposed based on this model, which could pick up not just the presence of different uses in adjoining cells, but also the nature of those uses (Bordiloi, 2013). These models are still of limited value to this study as they are based on the analysis of proximity rather than intensity, being concerned with surrounding land uses rather than the particular nature of land uses within the subject cells. Further, none is designed to consider the three dimensional aspects of land use on the many floors levels, which are typical of urban centres.

In line with common practice in the analysis of land use mix a new model was developed to fit the desired outcomes of the research (Song and Rodriquez, 2005) and to address the shortcomings of existing models. This is referred to as the Mixed Use Index (MUI). It is a grid-based index which provides a value for each cell based on the number of distinct land uses observed within each cell. It measures the intensity of mix of use rather than proximities of surrounding land uses and it is three-dimensional in that it considers all floors or levels within the cell. The same 20m by 20m cell grid is deployed in the urban grain analysis was adopted for MUI and it was found to be ideally suited to the scale of urban grain. Using the same grid could also allow the values for land use mix and the urban grain to be directly overlaid. Most importantly, the model could provide an accurate representation of the spatial distribution of land use mix within the study areas, which is essential in seeking to establish any relationship between land use mix and fine urban grain in the study areas.

Finally, mean cell values from the MUI for each study area were calculated to provide a general and broad comparison of the mix of use in both study areas. The mean value for each study area was calculated by dividing the sum of all the cell values for all cells by the total number of cells in the study area.

5.3.6.6 Mix of use and urban grain

The land use mix and urban grain datasets were collated and coded using the same cell referencing system. This allowed the datasets to be directly overlaid and correlated. An initial sense check of the data (plotting and observing the data) was carried out to establish basic relationships within the data. It was decided to use Pearson's correlation coefficient (or Pearson Product Moment) to quantify the strength of the relationship between these two variables, as it had been used in recent, related studies (e.g. Song, Popkin and Gordon-Larsen, 2013). The Pearson Product Moment gives the mathematical magnitude of association strength to any set of numerical data.

Pearson's correlation coefficient provides values of between -1.0 and +1.0, with -1.0 indicating the strongest negative relationship and +1.0 indicating the strongest positive relationship between the variables. The strength of the relationship was described with reference to current best practice in this area (Dancey and Reidy, 2007; Strathclyde University, 2015). Table 5.2 indicates the strength of correlation associated with the values against which the analysis in the case studies is benchmarked.

Value of the correlation coefficient	Strength of correlation
1	Perfect
0.8 – 0.9	Very strong
0.5 – 0.8	Strong
0.3 – 0.5	Moderate
0.1 – 0.3	Modest
>0.1	Weak
0	Zero

Table 5.2. Correlation coefficient values and strength of correlation.

It was then decided to leverage a descriptive statistical approach to support the correlative analysis as the statistical significance of the studies was low while the mathematical relative strength of the relational effect was high. This is a common approach and it was considered the most appropriate for this study as:

- The samples/case study areas were chosen on a non-random basis;
- The datasets and the variables being explored had similar characteristics, given that they were chosen on the basis of representing fine and coarse urban grain typologies. This resulted in a non-standard distribution which

would require very significant transformation (many computational iterations);

- The samples/case study areas were relatively small in size; and
- The purpose of the study was not to provide a predictive model.

The descriptive approach provides an analysis of associations and segments of similar behaviour, rather than tests for statistical significance using regression analysis. It provides another statistical measure in the form of trend analysis and line fitting. The r^2 value is a measure of the 'goodness of fit'. In other words, how likely it is that the data are following a particular trend. This technique also shows whether relationships are positive or negative. To add further statistical verification, trend lines (linear and moving averages) were used as appropriate to illustrate relationships.

5.3.6.7 Mix of ownership and urban grain

The mix of ownership survey was produced in a vector format, which was later transformed into raster format. It was clear from the analysis that small changes in ownership occurred between ground floor and upper floors in both study areas. Therefore, it was decided to produce two raster maps; one that included the principal ownership of the ground floor and the other that included the principal ownership of the upper floors combined. The categories recorded were independent, chain/multiple and vacant as was common in other studies (NEF, 2010).

The urban grain and ownership datasets used the same cell grid and each cell was numbered and geo-referenced. As with the mix of use analysis, Pearson's correlation coefficient was used to quantify the strength of the relationship between these two variables. A descriptive approach to the analysis was taken given the characteristics of the data. There were only two possible values for ownership; multiple/chain ownership (value=1) and independent ownership (value=2). Vacancy was excluded from the analysis as it was already considered in the mix of use analysis. In this analysis trends were established using modes and averages. Ground floor ownership and principal upper floor ownership were compared and contrasted.

5.3.6.8 Analysis of mix of business

This analysis included density of business, density of evening uses and business relationships. The business and evening uses data were provided in point format. The data were not suitable for rasterisation as reasonably accurate extents (footprints) could not be established for each business or evening use and applying density values

to plots would have been misleading. For example, a single large footprint of a shopping centre with numerous businesses would achieve high cell values across its full extent, whereas the same number of smaller businesses across the same extent but within numerous smaller footprints would achieve low cell values. The location of the front door of each business was noted instead (internal access would have been required to ascertain accurate business footprints).

The business mix and evening economy data in the study area were analysed using the same density-based based approach that was used for the analysis of urban grain. The number of discrete businesses and evening uses per hectare was recorded to give a density figure for each urban block in both study areas. These figures were then correlated with the corresponding plot density (urban grain) figures. As with the land use mix analysis, Pearson's correlation coefficient was used to quantify the strength of the relationship between the variables. A descriptive approach to the analysis was taken given the characteristics of the data. In the case of the business and evening uses data, a cluster analysis was provided along with fitted trend lines.

A descriptive approach was also taken for the analysis of the local businesses relationships survey. The location of the respondents was mapped to show the spatial distribution of responses across the study areas. The three principal survey questions were analysed separately using appropriate charts and descriptive statistics. Plot size was used to distinguish between responses from fine urban grain (small plots comprising 300sqm or less) and coarse urban grain (large plots comprising more than 300sqm). This was based on current literature in the area as shown in Figure 2.6 (Chapter 2). An emphasis was then placed on comparative analysis between fine urban grain and coarse urban grain.

5.3.7 Interpretation of findings, discussion and conclusions

A deeper consideration of the case studies was undertaken, following the initial analysis, to provide a more meaningful interpretation of the findings and to allow for general inferences to be drawn (Simons, 2009). The interpretation sought to consider the claims under their contribution at a level that was appropriate to the current policy and theory. Inferences were provided at a higher level than experiment or survey given the social nature of this research. The previously developed theory and policy in this area was used as a template with which to compare the empirical results of the case studies. This allowed for a process of 'analytical generalisation' as described by Yin (2009).

The final element of the research strategy was the preparation of the overall conclusions and the implications of the research for theory and practice. This was structured around the original research objectives and the research aim. Each research objective was dealt with individually. Emphasis was placed on setting out the impact of the research at different levels of the theory and policy. Challenges were made where the findings contradicted the prevailing theory and policy. Verifications were made where the findings supported existing theory and policy. The conclusion also focussed on the implications of the findings for diversity and the key planning objectives of vitality and viability of urban centres.

Following the conclusions, a review of the implications of the research for current theory and practice was undertaken. In terms of the theory, areas in need of further research and revision were highlighted along with the potential for the research to assist in building new theory. In terms of practice, a range of shorter-term objectives was considered to deal with low levels of knowledge, contradictions in urban policy and weak guidance. Areas for further research in theory and practice were also identified.

5.4 Summary of the research design

This research has been designed to investigate the theory around fine urban grain and its relationship with key aspects of diversity, namely mix of uses, mix of ownerships and mix of businesses. The research was deductive in nature given that a detailed theoretical framework existed in this area and that it was possible to identify variables and hypotheses at the outset.

The research strategy was based on case study. It was chosen as it could provide a deep insight into the variables of the research. It was also highly amenable to comparative study, a necessity for this research. Two case studies were chosen on the basis of criteria, which sought to deliver two areas of contrasting urban grain and where the influence of other potential variables, such as accessibility and overall function could be minimised.

A range of techniques was chosen spanning data collection and analysis. The techniques used were based on current best practice in related areas of spatial and statistical research. Bespoke techniques were created where existing techniques were not available or considered unsuitable for the research. The analysis of the surveys was carried out using a combination of GIS and statistical techniques.

5.5 The case study areas

The case study areas are located in Dublin City Centre, within the city canals (Figure 5.2). They are located either side of the River Liffey, which bisects the city centre. Both areas are well served by light rail (tram) and heavy rail (suburban and national rail) and suburban, regional and national bus services. Both areas are within the historic core of the city.

The areas are within the designated retail core of the city and consist of Category One (primary) and Category Two (secondary) shopping streets (Dublin City Council, 2011) (Figure 5.3). They are functionally specialised as city retail cores and this is reflected in the high levels of retail in the land use of the study area (Keane, Doyle and Gocur, 2011). The study areas are also within the functional area of the Dublin City Council and Dublin BID (a statutory agency with a key role in managing, marketing and maintaining aspects of the public domain of the city centre). All local businesses are *de facto* members of Dublin BID.

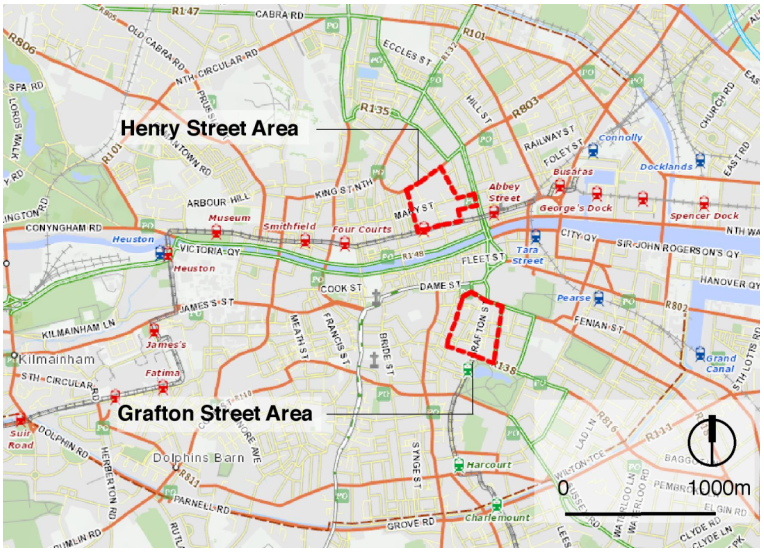


Figure 5.2. Location of the case study areas in Dublin City Centre (Base map used in accordance with usage rules of Myplan.ie).

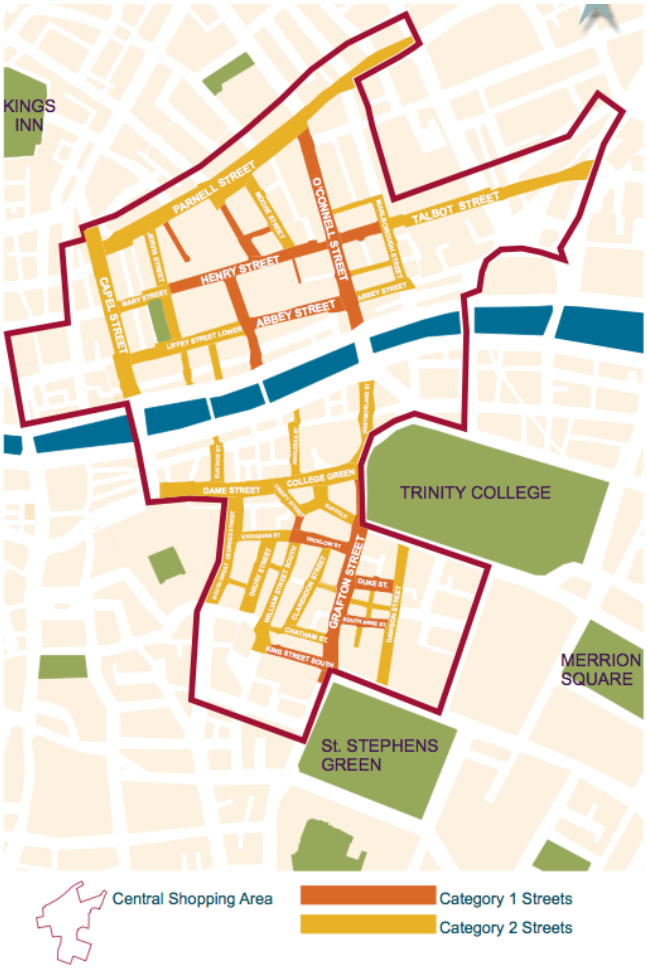


Figure 5.3. The designation of the city centre retail core (Dublin City Development Plan 2011-2017) (Dublin City Council, 2011). (Used with the permission of Dublin City Council).

5.6 The Grafton Street case study area

Grafton Street is the 'name-giver' and the heart of the Grafton Street shopping core of the south side of Dublin City Centre. The area is strategically located immediately south of the city's main civic corridor, which connects the north and south sides of the city, via the city centre's main bridge, O'Connell Bridge. It is bounded to the north by Suffolk Street, a busy traffic corridor, to the west by South William Street, a bustling secondary retail and mixed use street, to the south by King Street South and St Stephen's Green and to the east by Dawson Street, another busy traffic route.

Figure 5.4. Oblique aerial view of the Grafton Street study area (Used in accordance with Google usage rules).

5.6.1 Historical development

The Grafton Street area developed around the spine of Grafton Street (Figure 5.5). The street was originally a small, meandering medieval lane connecting the old city centre with a larger green or common (now St. Stephen's Green) (Lennon, 2008). It was partially developed by 1708, when it was first referred to as Grafton Street, but its completion came with the development of two distinct land holdings/small estates which provided the east and west frontages of the street. It appears to have been fully developed by 1756, accommodating, even then, a small and eclectic mix of food and clothing retail (McCullough, 2007; Lennon, 2008). The street has changed gradually over the years, however, new additions or consolidations have been limited in number and these have been mainly associated with the development of department stores. Unlike the Henry Street area, there have been no amalgamations of urban blocks in the study area since it was first developed as an estate.

Figure 5.5. Historic maps of the Grafton Street area; Jean Rocque's City Survey in 1756 (left) and the 19th century historic '6 inch map' (right) (Used with the permission of the publishers).

5.6.2 Form, character and permeability

The area is roughly rectangular in shape and measures approximately 11.4 hectares (Figure 5.6). Grafton Street is the spine of the area. It is orientated roughly north-south and measures approximately 360 metres in length. The southern end of the Grafton Street is at a slightly higher elevation and is commonly referred to as the 'top' of Grafton Street. The other end, at Suffolk Street, is commonly referred to as the 'bottom' of Grafton Street. The street has an organic, slightly curved, s-shaped plan, which closes out views at both ends and along its course. The area is roughly 300m wide on the east-west axis.

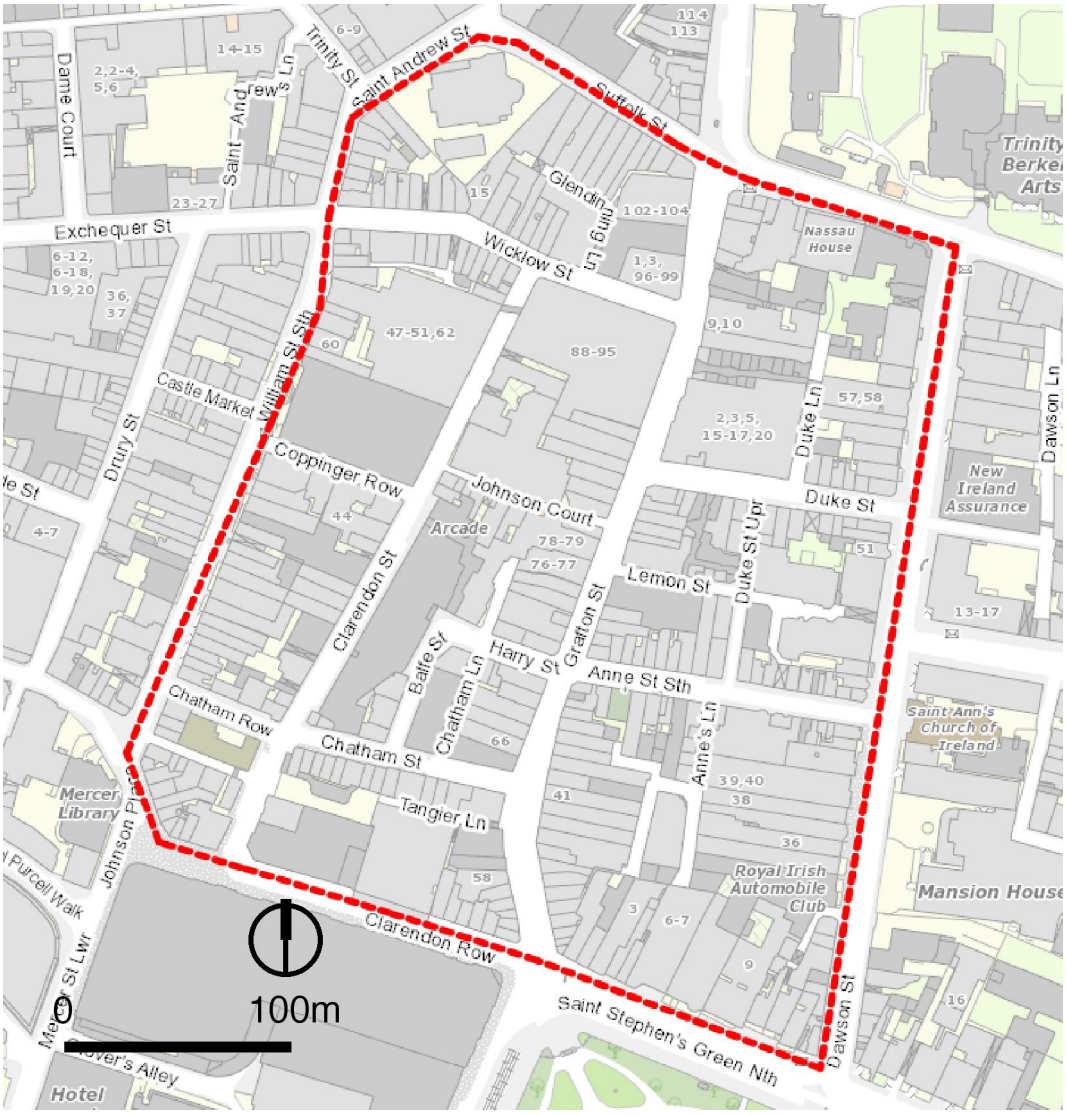


Figure 5.6. Grafton Street study area (Base map used in accordance with Myplan.ie usage rules).

Overall, the area is noted for its unique identity and its high quality urban character. The streets and spaces in the area provide a good degree of continuity and enclosure of urban space. The street width is relatively narrow and building height is generally in the range of 3 and 5 storeys. Building frontage is continuous with no gaps and all intersections and roads are relatively narrow. The combination of the streetscape, distinctive architecture and notable landmarks of the area are considered to contribute strongly to the character of the study area (Dublin Civic Trust, 2012).

The area is characterised by smaller urban blocks and this provides good connections to surrounding areas. Grafton Street has eight secondary streets or lane intersections along its length, leading to the busy perimeter streets. The frequency of intersections

(spaced on average every 45m), along with the relatively small urban block size (frontage blocks average approximately 6,500sqm/0.65 ha) provides good pedestrian permeability in the area. The urban grain of the Grafton Street area is analysed in detail in Chapter 6.

Figure 5.7 Fine grain (top left) and coarse grain (top right) and street performers (bottom left) on Grafton Street, and active speculation and amalgamation of fine urban grain on Anne Street South (bottom right). (Photos by author)

5.6.3 Accessibility

The Grafton Street area is highly accessible to all modes of transport. Heavy suburban and intercity rail services are within 800m of the street (at Pearse and Tara Street Stations). Light rail is located at the southern end of the Grafton Street on St Stephen's Green (the LUAS Green Line terminus, which serves the south city and is currently being extended along the eastern and northern boundaries of the study area).

Suburban bus routes (express and normal services), which serve the city centre and the south and south-east of the city, converge on adjoining and adjacent streets.
There is a number of large multi-storey car parks in and adjoining the study area and these give rise to localised traffic congestion, particularly on South William Street, Wicklow Street and Clarendon Street. A recent study found that there were approximately 2,500 car parking spaces in multi-storey car parking in or in the immediate vicinity of the study area (Dublin Civic Trust, 2012). The study also found that the car parking capacity was rarely reached, indicating that supply exceeds demand and that levels of accessibility for private cars is adequate.

Grafton Street is pedestrianised from Suffolk Street at its northern end to St Stephen's Green at its southern end. There are short extensions of the pedestrianisation into side streets and lanes of Grafton Street. The area is connected to the retail core of the north side of the city centre (Henry Street area) by established pedestrian routes, via the Temple Bar area and the pedestrian river bridges. Grafton Street is a busy pedestrian through route its own right, connecting the city centre with the LUAS and parts of the south inner city. The footfall volumes show that, consistently and throughout the year, about 500,000 pedestrians pass through the street each week (Dublin BID, 2014). Total movements during the week are relatively even, with slightly increased numbers on Thursdays and Fridays. In terms of daily trends, volumes rise to a peak at around 7pm on all evenings, with a slow tail-off to morning numbers by midnight. This appears to reflect the commuting pedestrians and the range of late night activities in the area. A small peak in the morning indicates the presence of commuting pedestrians.

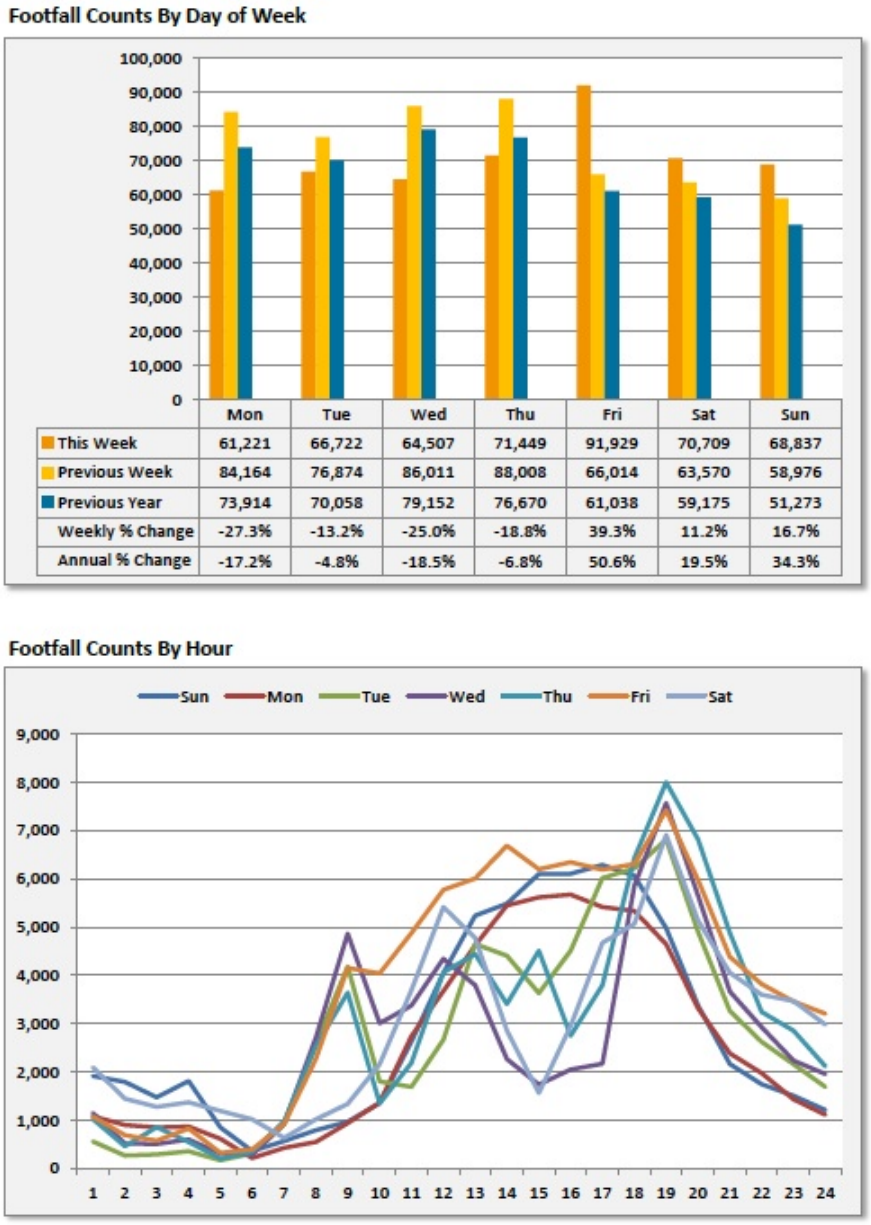


Figure 5.8 Weekly segment of pedestrian movement data on Grafton Street (Dublin BID, 2014). (Used with the permission of Dublin BID).

5.6.4 Land use

The mix of use in the area reflects its designation as a mixed-use retail core, with varying levels of dominance of retail and service uses at ground floor. A land use study for Dublin BID (Keane, Doyle and Gocur, 2011) considered land use for the ground floor only of the main streets of this study area. It found that:

- There was a decrease in the overall number of retail uses with an increase in newsagents, pharmacy and convenience foods and a change of use to café, bar and restaurant on the secondary streets;

- The mix of retail on Grafton Street had declined with a change from fashion retail to volume retail such as phone shops and convenience stores;
- There was a rapid fall off in retail rates from primary to adjoining secondary streets, almost halving, coupled with a big increase in services, pubs, cafes and restaurants;
- The area remained a popular destination with a significant and growing proportion of pubs, cafes and restaurants in secondary streets;
- Rates of vacancy varied greatly in the area with possibly the lowest rate in the city centre on Grafton Street (6%) to medium and high rates on the secondary streets (28% on South Anne Street);
- There was a loss of office use in the area, principally from Dawson Street, and it was replaced with pub, club and restaurant uses;
- Secondary streets such as South Anne Street and South William Street, were highly mixed in use, but were still troubled by high vacancy rates; and
- The Powerscourt Townhouse Shopping Centre was retail dominated with poor use mix and extremely high levels of vacancy.

It was apparent from the land use survey for this research that the high levels of vacancy in South Anne Street, which contrast with otherwise high levels of occupancy on the street, are the result of site amalgamation for speculative redevelopment.

The results of a study of the South William Street Area, which accounts for about half of the case study area (Dublin Civic Trust, 2012) provide an additional dimension to the understanding of the vitality and viability of the area. It found that ground floor frontage to the street was largely active in nature (approximately 75% of the frontage in the area comprised active uses spilling out to the pavement or direct access from the ground floor) indicating a good degree of vitality. It also showed that upper floor vacancy was relatively low, at below 10%, on the secondary streets off Grafton Street, such as South William Street. It also found that office use accounted for almost 40% of these uses, with residential, services and retail all accounting for less than 10%.

Residential use is highly concentrated to larger multi-storey apartment buildings in the area. Although there are no accurate figures for residential population in the study area, small area population figures from the census in 2011 (CSO, 2015) can be used to provide an estimate of 800 persons.

An earlier study and strategy carried out by Dublin City Council (2008), noted that the retail of the Grafton Street area was mixed in nature with few larger scale retailers. This was considered then as a problem given the desire of retailers for larger floorplates (Figure 5.9). It also highlighted the rich mix and broad distribution of smaller scale supporting uses for retail in the area.

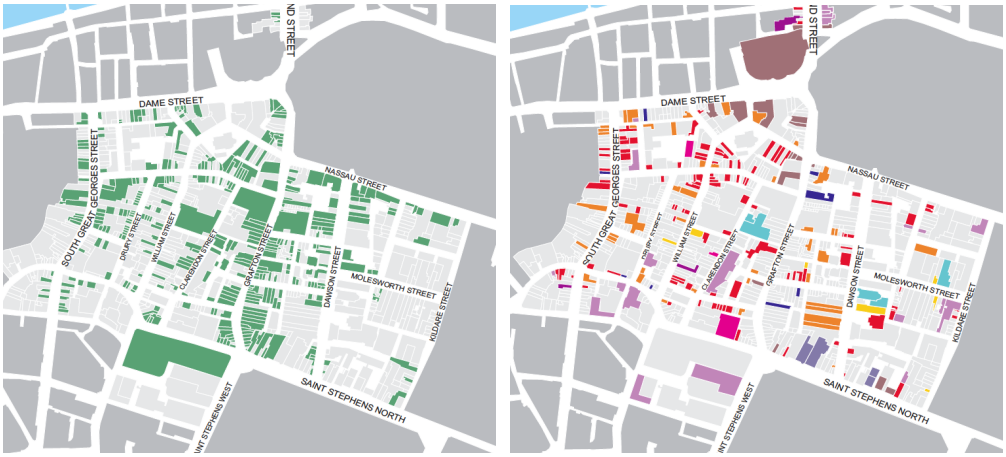


Figure 5.9 Ground floor retail (left) and support uses, such services, café, leisure, hotel and civic (right) in the study area (Used with the permission of Dublin City Council).

The studies carried out to date support the contention that the area has a relatively high level of mix of use. This is significant for the research as mix of use is a key component of diversity and diversity is the key concept underlying the claims for the research.

5.6.5 Employment

There were approximately 5,353 employment places in the area in 2011, based on median figures from census data (National Transport Authority, 2013) (Figure 5.10). These figures are provided for cells on a 250m grid and are interpolated to provide estimates. Approximately 75% of the area had a very high density of employment (ranging between 2,501 and 4,027 persons per cell of 6.25 hectares or a median figure of 522 workplaces per hectare). The remainder of the area had a high density of employment (ranging between 1,001 and 2,500 persons per cell of 6.25 hectares or a median figure of 280 workplaces per hectare).

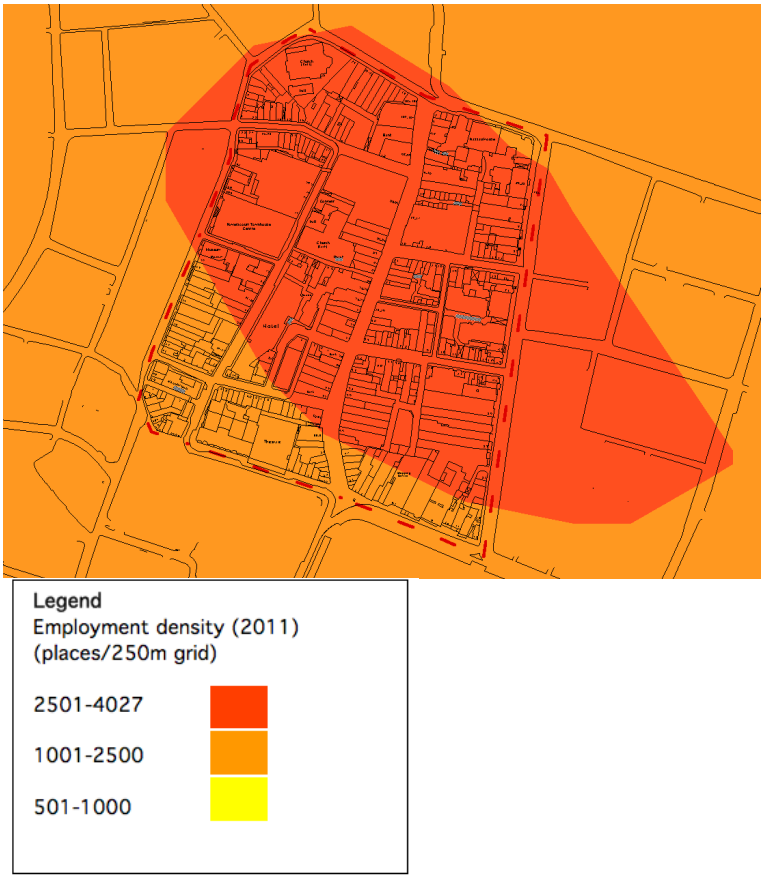


Figure 5.10. Employment density (workplaces) in the Grafton Street area (Author based on National Transport Authority, 2013).

5.6.6 Planning policy

The area has been designated as a retail core in city planning policy since 1980s. The City Development Plan contains a range of policies, which seek to maintain the function of these areas, particularly for specialist shops and as the primary location for comparison retail. The current designation of primary and secondary streets in the area controls changes of use from existing retail to other uses. The street is zoned for commercial purposes; 'Zone Z5: To consolidate and facilitate the development of the central area and to identify, reinforce and strengthen and protect its civic character and dignity' (Figure 5.11). The public spaces of Grafton Street and most of the surrounding streets in the area are part of a larger designated Conservation Area covering the main civic corridors of the city centre. Most of the built fabric of the study area is designated as an Architectural Conservation Area (ACA). This designation de-exempts certain classes of minor development from the need for planning permission. There is a concentration of protected structures on South William Street, Dawson Street, South Anne Street and St Stephen's Green. This

designation provides statutory protection and requires planning permission for most alteration or additions. It is surprising that more buildings on Grafton Street are not protected structures given their apparent character and heritage significance.

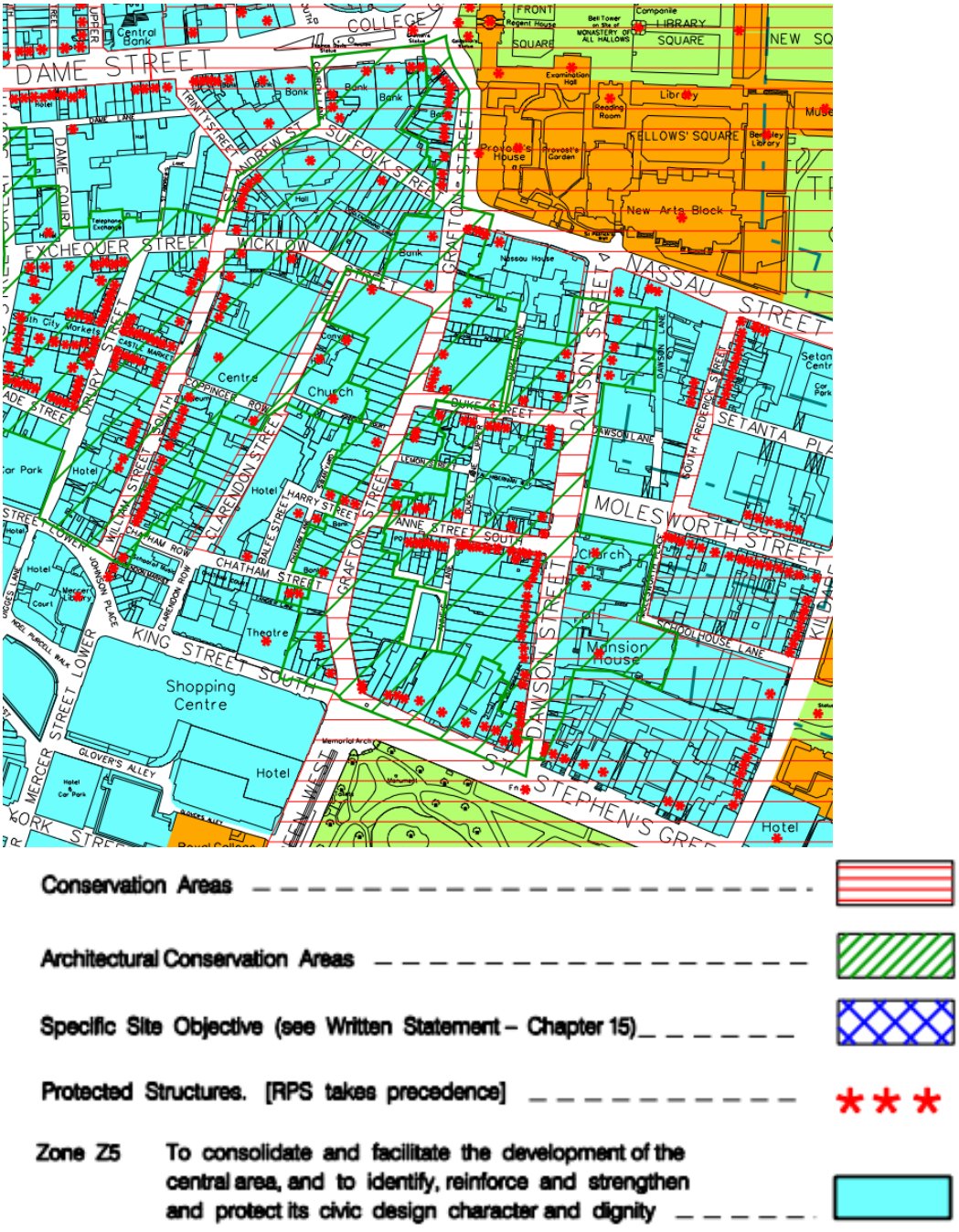


Figure 5.11. Excerpt from the current zoning map (Dublin City Council, 2011). (Used with the permission of Dublin City Council).

5.6.7 Vitality and viability of the Grafton Street area

Overall, indicators suggest that the area has a relatively high degree of vitality and viability. This is highlighted by the nature of the footfall, which shows a high level of pedestrian traffic throughout the week, with a notable extension of footfall beyond normal business hours on most days and in particular at the weekend (Dublin BID, 2014). The land use studies also show a robustness of land use mix, with changes occurring almost organically in the balance of uses in the area, and the growth of the evening economy in secondary streets around Grafton Street (Keane, Doyle and Gocur, 2011). Additionally, vacancy levels on primary and secondary streets appear to have remained relatively low, despite the onset of recession, with upper floors in particular, faring well on some secondary streets (Keane, Doyle and Gocur, 2011; Dublin Civic Trust, 2012). Another indicator of the vitality and viability of the area is the high numbers in employment in the study area. The figures show that the area had one of the highest densities of employment in the entire city (National Transport Authority, 2013). It was also clear that office use in secondary streets and upper floors plays an important part along with retail in providing this employment (Dublin Civic Trust, 2012).

5.7 The Henry Street case study area

Henry Street is the 'name-giver' and the heart of the Henry Street study area. It is the city's shopping core on the north side of Dublin City Centre. The area is strategically located immediately west of O'Connell Street, the city's main civic corridor. It is bounded to the north by Parnell Street, a busy traffic corridor, to the west by Jervis Street, which currently serves as a local access street, to the south by Lower and Middle Street, a light rail corridor with mixed use and low levels of activity and to the east by Moore Street, O'Connell Street, Prince's Street North and William Lane.

Figure 5.12. Oblique aerial view of the Henry Street study area (Used in accordance with Google usage rules).

5.7.1 Historical development

Development of the Henry Street area commenced at different stages in the early Georgian period (Lennon, 2008). The Jervis Estate, covering the western half of the study area to Liffey Street, was the first section to be developed in the 1670s. Development of the Moore Estate, stretching form Liffey Street to modern day O'Connell Street commenced in the 1720s. Development of the area was largely complete by 1756. Parnell Street was a pre-existing ancient route into the city.

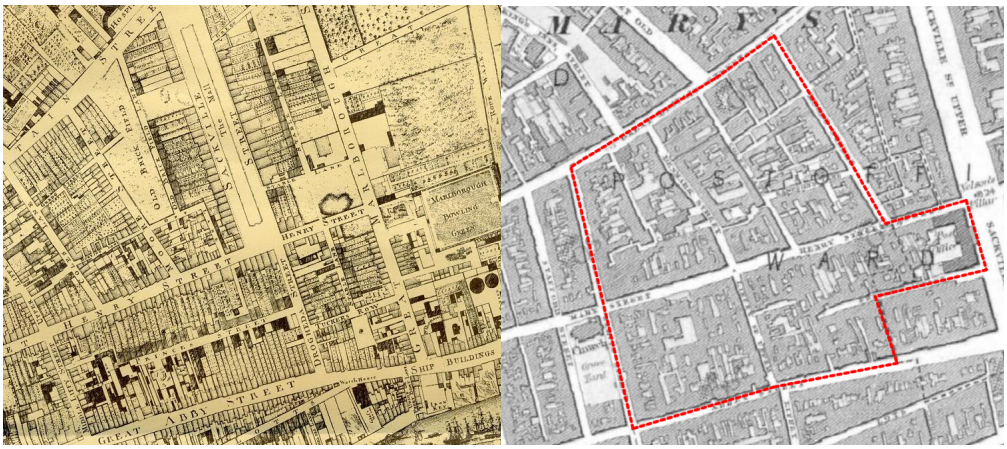


Figure 5.13. Historic maps of the Henry Street area - Jean Rocque's City Survey in 1756 (left) and 19th century historic '6 inch map' (right). (Used with permission of the publishers).

The area was initially developed for townhouses, but incorporated retail and office uses from an early stage. The street changed gradually from residential to commercial use during the 19th century. At this time, a department store was inserted into the street (now Arnotts Department Store). Major changes occurred to the street during and after the 1916 Rising, during which many of the buildings in the area were destroyed by naval shelling. Much of the fabric of the eastern end of the street was reconstructed in the 1920s. Many plots were amalgamated into larger plots for larger scale retail and office development (e.g. the General Post Office, Arcade and Office Buildings). Dublin Corporation's 1970s Inner Tangent Road Scheme, which reserved the southern side of Parnell Street West for demolition for road expansion, had a major impact on the northern boundary of the area. This destructive road objective brought blight for a number of years through decay and lack of investment in the area.

The road scheme was followed by major property speculation and site assembly by the Irish Life Investment Company to facilitate the development of their shopping mall, the ILAC Centre. The site assembly and consolidation included large numbers of small plots and resulted in the merging of a number of existing urban blocks. The ILAC centre opened in 1981, and it remains the largest city centre retail mall in Dublin (comprising approximately 70,000sqm of retail and related space). The redeveloped frontage to Parnell Street West was finally completed in the early 2000s when apartments over ground floor retail were constructed. Redevelopment of a major department store was carried out at 54-62, Henry Street in the early 2000s and this was soon followed by the refurbishment and expansion of others on Henry Street and Mary Street. Mary Street contains two long-established department stores (Penneys and Marks and Spencer) and a more recent, multi-level shopping mall constructed in the late 1990s (The Jervis Centre).

5.7.2 Form, character and permeability

The area is irregular in shape and measures approximately 10.6 hectares (Figure 5.14). Henry Street and Mary Street form the spine of the area, which is orientated roughly east-west. It measures approximately 420 metres in length and it is part of a longer 1,300m long street axis from Capel Street to Amiens Street. The area measures 380m on the north-south axis. It is remarkably level and the street pattern in the area is relatively regular as a result of its historical planned estate development.

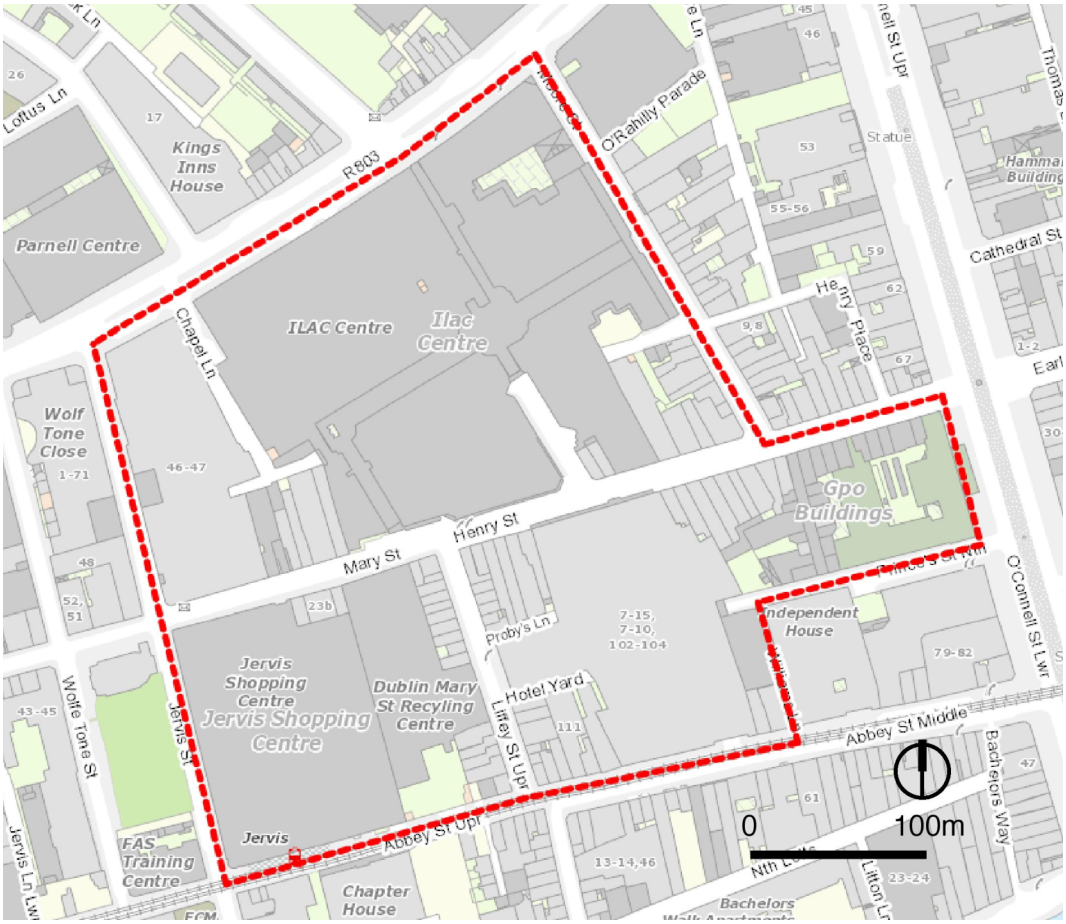


Figure 5.14: The Henry Street study area (Base map used in accordance with Myplan.ie usage rules).

Block sizes in the Henry Street are large, giving rise to few intersections along its length and low levels of pedestrian permeability. The ILAC shopping centre urban block alone measures at 5.2 hectares and it is the largest such urban block in the city centre retail core (this is approximately 5 times the area of the typical city centre block in the city centre). There is variation in the continuity and enclosure of streets in the Henry Street area. The street scale is relatively consistent along Mary Street and Henry Street within an attractive range of building heights (between 4 and 5 storeys). This human scale is lost at Parnell Street where the development of the wide road and the excessively scaled redevelopment of the street edge results. Building frontage is relatively continuous in the area with small gaps on secondary frontage only. The urban grain of the Henry Street area is analysed in detail in Chapter 6.

Figure 5.15. Coarse urban grain at the ILAC centre on Henry Street (top left), a remnant enclave of fine urban grain on Henry Street (top right), a long established department store (now Penneys) on Henry Street/Jervis Street (bottom left) and the main shop window of Arnotts Department Store on Henry Street (bottom right). (Photos by author)

5.7.3 Accessibility

The area is located in an area of high accessibility to all modes of transport. Heavy suburban and intercity rail services are within 800m of the street (at Connolly Station and Tara Street Stations). Light rail is located on the southern boundary of the area on Middle Abbey Street (the LUAS Red Line, connecting with the western suburbs and the Docklands). Suburban bus routes (express and city services), which serve the city centre and the north and south-west of the city, converge on O'Connell Street and other nearby streets. There are a number of large, multi-storey car parks in the study area and these give rise to localised traffic congestion, particularly on Parnell Street, Jervis Street and Capel Street. There are approximately, 2,600 spaces in multi-storey car parking in, and in the immediate vicinity of, the area (Parnell Street, ILAC, Jervis and Arnotts car parks) and these appear to meet current demand.

Henry Street and a part of Mary Street are pedestrianised. There are short extensions of the pedestrianisation into Moore Street and Liffey Street. Henry Street is not a significant pedestrian through-route and most footfall is associated with shopping. It does, however, provide a direct connection between the secondary shopping streets of

Capel Street and Earl Street/Talbot Street. The area is connected to the retail core of the south side of the city centre (Grafton Street) by established pedestrian routes, via the Temple Bar cultural area and the pedestrian river bridges.

The footfall volume figures from Henry Street (Figure 5.16) show that, consistently throughout the year, about 350,000 pedestrians pass through the street each week, with this volume rising significantly in the pre-Christmas period to around 500,000 each week (Dublin BID, 2014). During the week, pedestrian numbers are noticeably greater on Thursdays, Fridays and Saturdays. In terms of daily trends, it is clear that numbers rise to a plateau at about 2pm, peaking at around 6.30pm (up to 9,000 pedestrian per hour) and falling sharply by 8pm. These figures reflect the retail focus of the area and the lack of evening uses. They also show little evidence of commuting pedestrian movement in the morning period.

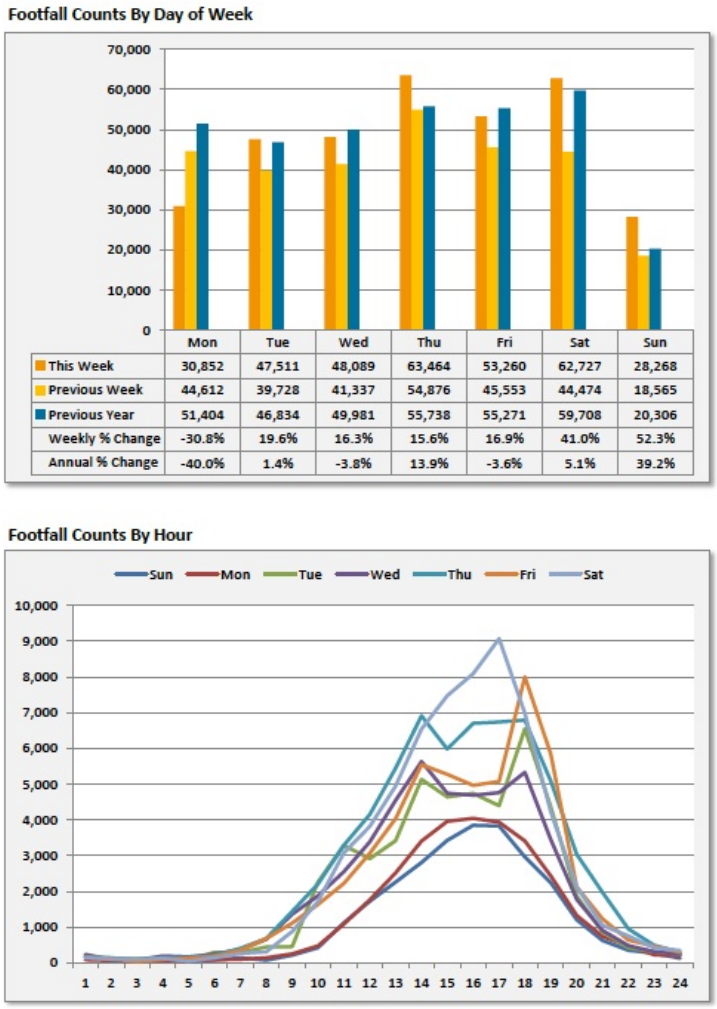


Figure 5.16 Weekly segment of pedestrian movement on Henry Street (Used with the permission of Dublin BID).

5.7.4 Land use

The Henry Street area reflects its designation as a mixed-use retail core, with high levels of retail uses at ground floor. The land use study for Dublin BID (Keane, Doyle and Gocur, 2011) found that:

- Land uses in the area appeared relatively 'static' with no major recent trends observed;
- There had been an established proliferation of convenience shops in the area, which had generally replaced retail. O'Connell Street was noted in this respect;
- Moore Street and Abbey Street had the highest vacancy in the retail shopping cores of the city centre, with over 25% of ground floor units being vacant;
- The area had a unique street market on Moore Street, which may have distorted the land use mix in the immediate area; and
- There was a noticeable trend towards cafes and restaurants on Parnell Street at the expense of retail.

It should be noted that the high levels of vacancy observed in the area also coincided with long-running attempts at large-scale site assembly, which had fallen foul of the planning process and the general decline in the Dublin property market.

Residential use is highly concentrated in larger multi-storey apartment buildings in the area. Although there are no accurate figures for residential population in the study area, small area population figures from the census in 2011 (CSO, 2015) can be used to provide an estimate of 1,100 persons for the area.

An earlier study and strategy carried out by Dublin City Council (2008), noted that the retail of the Henry Street area was dominated by larger scale retailers and showed a marked contrast with the Grafton Street area in this respect (Figure 5.17). It also highlighted problems with very few supporting or ancillary uses in the area.

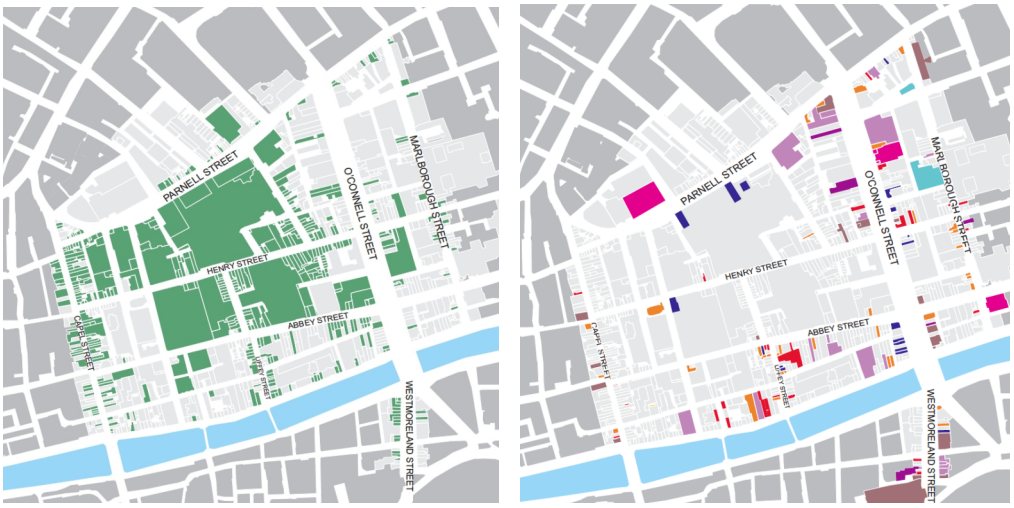


Figure 5.17 Ground floor retail (left) and support uses, such services, café, leisure, hotel and civic (right) in the study area (Used with the permission of Dublin City Council).

The studies carried out to date support the contention that the area has a moderate level of mix of use, with a dominance of retail uses and few ancillary or support uses. This is significant for the research as mix of use is a key component of diversity and diversity is the key concept underlying the claims for the research.

5.7.5 Employment

There were approximately 3,094 employment places in the area in 2011, based on median figures from the 2011 Census (National Transport Authority, 2013) (Figure 5.18). These figures are provided for cells on a 250m grid and are interpolated to provide estimates. The vast majority of the area is included in an area of high density of employment (ranging between 1001 and 2500 persons per cell of 6.25 hectares or a median figure of 280 workplaces places per hectare). A very small portion of the area is within an area of very high employment density (ranging between 2501 and 4027 persons per cell of 6.25 hectares or a median figure of 522 workplaces per hectare).

Figure 5.18. The density of workplaces in the Henry Street area (Author based on National Transport Authority, 2013).

5.7.6 Planning policy

As with the Grafton Street area, this area has been designated as a retail core in city planning policy since the 1980s. The City Development Plan contains a range of policies, which seek to maintain the function of these areas, particularly for specialist shops and as the primary location for comparison retail. The current designation of primary and secondary streets in the area controls land uses and in particular changes of use from existing retail to other uses. The area is zoned almost exclusively for commercial purposes. The blue areas (Figure 5.19) are 'Zone Z5: To consolidate and facilitate the development of the central area and to identify, reinforce and strengthen and protect its civic character and dignity').

The public spaces of Henry Street and part of Mary Street are designated as part of larger Conservation Area covering the main civic corridors of the city centre. The O'Connell Street ACA extends into the study area and includes a number of buildings at the eastern end of Henry Street and Capel Street. The ACA closely reflects the areas of remaining fine grain on Henry Street. The designation de-exempts certain classes of minor development from the need for planning permission. There are

concentrations of protected structures on O'Connell Street, Henry Street at the Moore Street junction and the Jervis Street end of Mary Street. This designation provides statutory protection and requires planning permission for most alteration or additions.

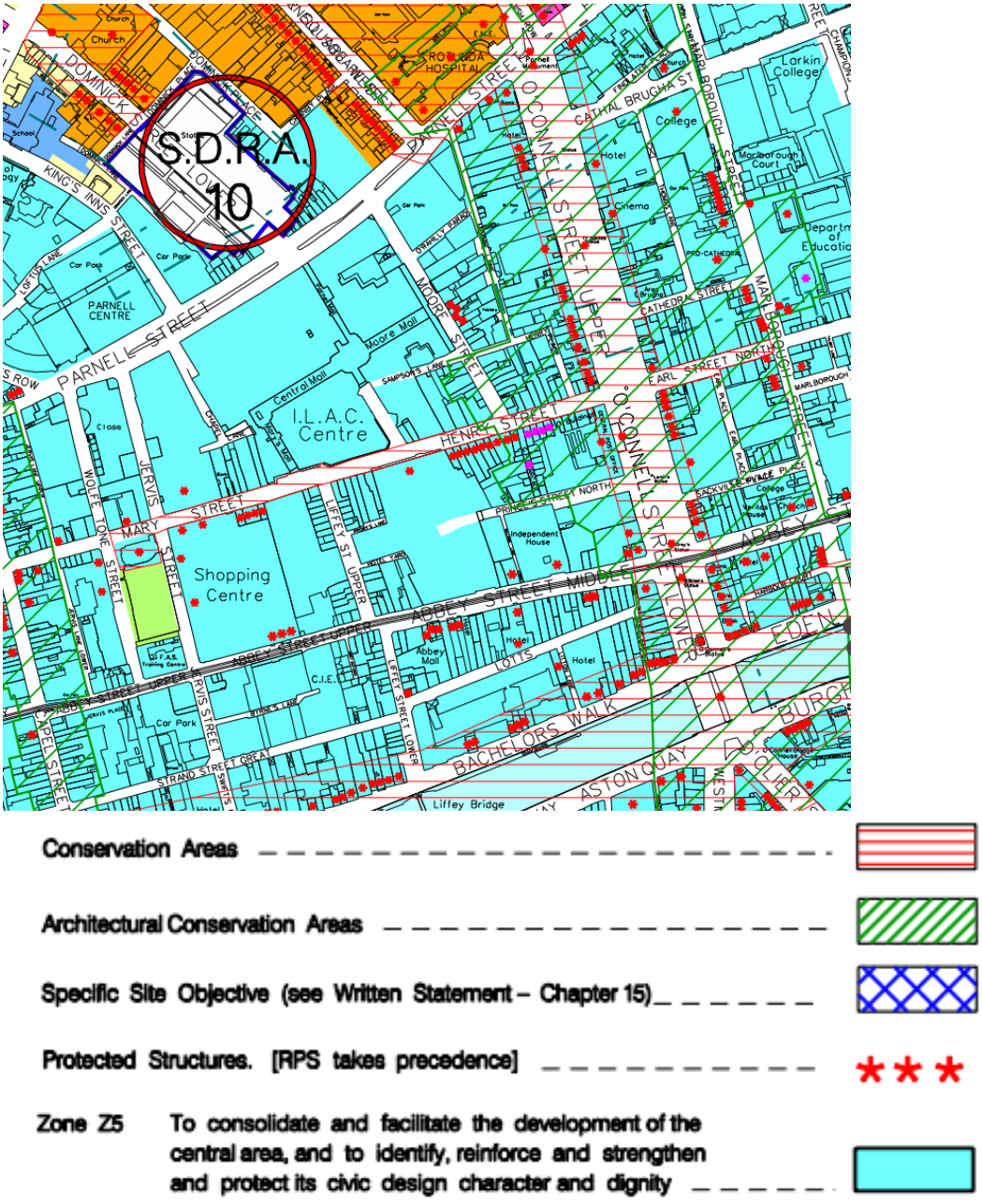


Figure 5.19. Excerpt from current 2011 zoning map Henry Street area (Used with the permission of Dublin City Council).

5.7.7 Vitality and viability of the Henry Street area

Overall, the indicators for the area suggest a mixed picture for vitality and viability in the area. This is evident particularly when comparison is made with the Grafton Street area. Footfall, while showing high volumes in the area during the week, is

highly focussed on normal business hours with only minor extension beyond normal business hours on most days and in particular at the weekend (Dublin BID, 2014). The land use studies also show an overall static land use mix in the area, with little evidence of the organic change in land use mix that occurred in the Grafton Street area. Allied to this has been an increase in vacancy and proliferation of convenience uses to replace or displace established retail (Keane, Doyle and Gocur, 2011), which would also indicate a decline in vitality and viability in the area. Unlike the Grafton Street area, the Henry Street area does not seem to have developed an evening economy on the primary or secondary streets and this no doubt is reflected the lack of footfall in the evening period. The area has a medium and high density of employment (National Transport Authority, 2013), similar to many surrounding areas of the city centre. This contrasts with the Grafton Street area, which had very high density employment. The heavy reliance of the Henry Street area on retail employment and the relatively low levels of office employment is likely to have affected the figures, which are also reflected in the high levels of vacancy in the area, particularly in upper floors (Keane, Doyle and Gocur, 2011).

5.8 Conclusions on the case study areas

The case study areas are long-established retail centres within the city and national hierarchy of retail centres. While both areas are specialised in terms of retail, they are also notable for their different levels of mix of use. The general studies carried out on land use in the area also indicated notable differences in use mix between primary and secondary streets in both areas. Vacancy was an issue in both areas, with secondary streets under pressure from development speculation suffering the most. The nature of change in land uses was different in both areas, although there was a more general move away from retail to services, cafes, and restaurants on key secondary streets. The profile of land use mix indicates that the Grafton Street area performs better than the Henry Street area in terms of diversity.

Both areas are highly accessible to all forms of transport, including light rail, heavy rail and bus. The footfall analysis for both areas shows similarities in the numbers of shoppers in both areas, but significant differences in terms of commuting pedestrians. It also highlights differences in the evening footfall indicating very different evening economies. The study areas have strikingly different urban form. This is particularly noticeable in the pattern of streets and urban blocks. The processes of change, particularly plot and block amalgamation, have been most evident in the Henry Street

area where the urban block and street patterns are now very coarse. In contrast, the original urban block and street structure in the Grafton Street area has remained largely intact through successive periods of development. The contrasting urban form of both study areas, within similar overall function and accessibility, provides a strong basis for the comparative aspects of the research.

The case study areas present contrasting profiles for vitality and viability, with a number of key indicators showing a robust and vibrant Grafton Street area and a still important, but largely static and underperforming Henry Street area.

6 FINDINGS AND DISCUSSION

6.1 Introduction

This chapter presents the findings and discussion of the research. It begins with the findings and discussion for urban grain, the independent variable of the research. This is followed by the findings and discussion of the first claim, which is around the relationship between fine urban grain and mix of use, the first dependent variable in this research. The chapter then proceeds with the findings and discussion for the second claim, which is around the relationship between fine urban grain and mix of ownership, the second dependent variable in this research. This is followed by the findings and discussion of the third claim, which is around the relationship between fine urban grain and mix of business, the third dependent variable in this research. The chapter is completed by a short summary.

6.2 The urban grain of the case study areas

The aim of this element of the research was to measure urban grain in both study areas using objective approaches. As the literature found that there was no such technique for measuring urban grain, a new technique was developed for this research based on existing techniques in related areas. This technique comprises two approaches; a density-based approach and a grid-based approach. The density-based approach expresses urban grain on an area and urban block basis and it is a common approach to measurement in practice in the built environment. The grid-based approach is a central feature of GIS and one that is commonly used in related studies for land use and transport. In essence, the density-based approach provides a boundary based measurement of case study area and the urban blocks, whereas the grid-based approach provides a more detailed measurement of urban grain within the study area boundaries. The techniques are used together to provide a good appreciation of urban grain in both study areas.

6.2.1 Mapping the plots

The first task was to establish the true extents of the urban plots in the case study areas. As discussed in Chapter 5 (Section 5.2), it was found that the digital base mapping did not accurately reflect spatial independence, which was found to be a key feature of the plot in the literature. This was rectified by external street survey and aerial photography to produce an accurate vector map of urban grain (Figure 6.1).

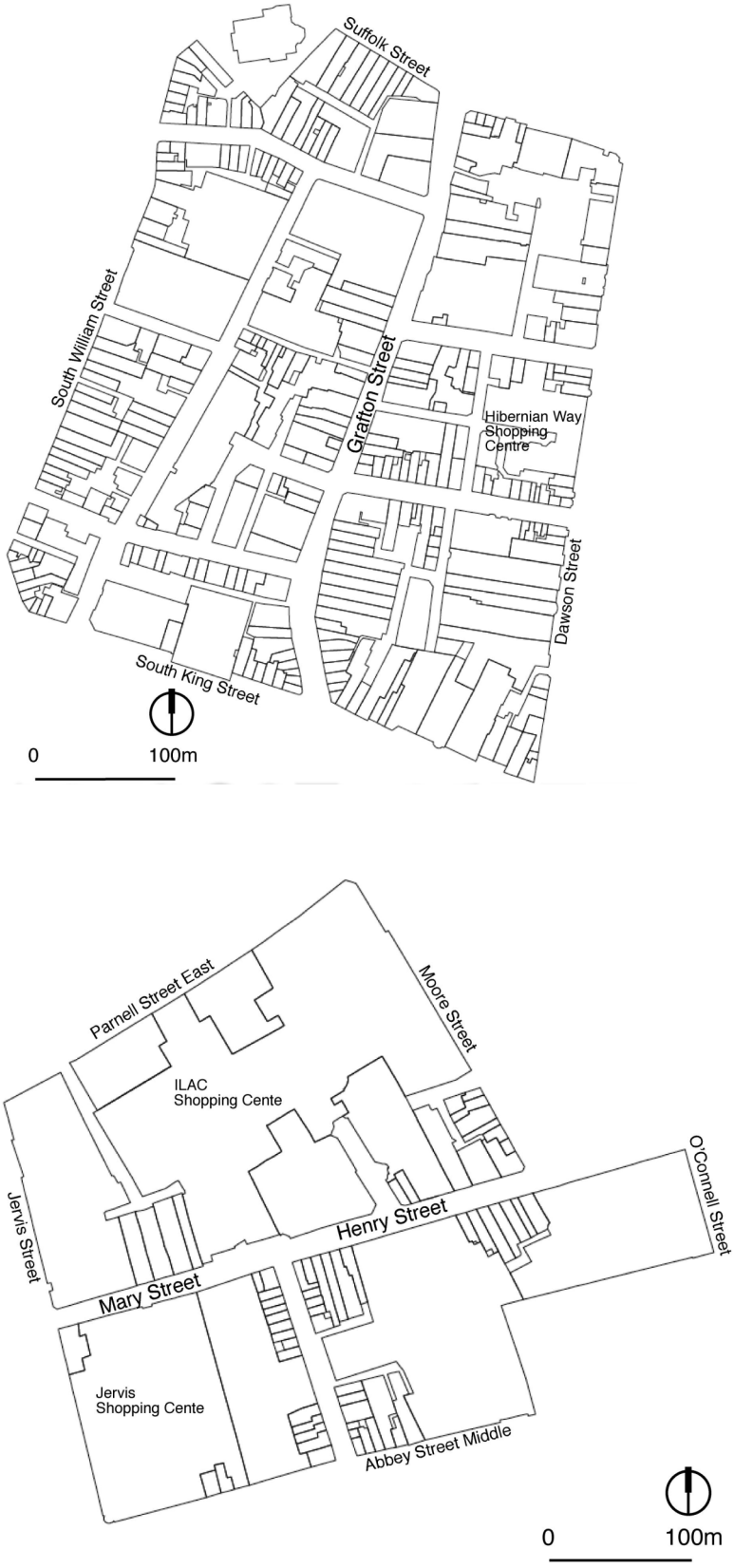


Figure 6.1. Base maps of the urban grain for the Grafton Street area (above) and Henry Street area (below).

As can be seen from Figure 6.1, the pattern of plots was quite distinct from the pattern of buildings, as only the plot boundaries were shown (the footprints of buildings and other structures were omitted). The internal units of larger building complexes such as shopping centres and malls do not constitute spatially-independent plots and were not shown on the urban grain mapping. The difference in the pattern of the urban grain in both case study areas is striking and it shows a much finer urban grain in the Grafton Street area than in the Henry Street area.

6.2.2 Urban grain – density-based approach

The initial analysis of urban grain was based on an area-wide and block-by-block, density-based approach (Figure 6.2). From the mapping it is clear that the Grafton Street area had a finer pattern of urban blocks with some 15 blocks in a gross study area of 11.4 hectares, whereas the Henry Street area had a much coarser pattern of urban blocks with 3 blocks in a gross study area of 10.6 hectares.

Figure 6.2. Density-based analysis mapping for the Grafton Street area (previous page) and Henry Street area (above).

The following table (Table 6.1) provides a breakdown of the urban grain for all blocks in both study areas, expressed as plots per hectare.

Grafton Street area	**Urban Grain**		**Henry Street area**	**Urban Grain**	
	Plots/ha	**Description***		**Plots/ha**	**Description***
Block A	33.7	Moderately fine	**Block A**	4.8	Mixed or coarse
Block B	21.9	Mixed or coarse	**Block B**	11.0	Mixed or coarse
Block C	28.3	Mixed or coarse	**Block C**	10.5	Mixed or coarse
Block D	13.6	Mixed or coarse			
Block E	46.9	Moderately fine			
Block F	40.7	Moderately fine			
Block G	54.1	Moderately fine			
Block G	44.9	Moderately fine			
Block I	68.6	Strongly fine			
Block J	30.7	Moderately fine			
Block K	42.0	Moderately fine			
Block L	34.9	Moderately fine			
Block M	39.2	Moderately fine			
Block N	97.3	Very fine			
Block O	42.4	Moderately fine			
Overall	**42.6**	**Moderately fine**		**8.7**	**Mixed or coarse**

Table 6.1. Urban grain as measured by plot density (* Description based on Table 2.1, Chapter 2).

From the analysis of plot density it was clear that the Grafton street area had a much finer urban grain than the Henry Street area (almost five times finer using this basic metric) and that there is a clear 'step' in the figures between both areas. Overall, the urban grain could be described as moderately fine in the Grafton Street area, whereas it could be described as mixed or coarse in the Henry Street area. The Grafton Street area figures reflected the largely intact traditional building fabric in that area, where amalgamation and consolidation of plots had been limited. The figures also reflected the description of the Henry Street area, where large-scale consolidation of plots and entire blocks occurred in the 1970s. It is also interesting to note the wide range in the figures across both study areas. The highest plot density/finest urban grain produced 97.3 plots per hectare (Block N, a small very fine grain block in the Grafton Street area, which has not changed appreciable since 1756) while the lowest plot density/coarsest urban grain produced a mere 4.8 plots per hectare (Block A in the Henry Street area, which includes the block amalgamations for the ILAC shopping centre, which opened in 1981). Notably, the coarsest urban grain block in the Grafton Street area (Block D, which includes a large department store) was still of greater plot density than any block in the Henry Street area. These figures support the choice of the case study areas in providing contrasting typologies of urban grain.

6.2.3 The grid-based approach

It was established that the grid-based approach provided the most objective way to not only locate fine and coarse urban grain but also to measure its 'fineness' or 'coarseness' within any user-defined area. As discussed in Chapter 5 (Section 5.2), the matrix of cells (Figure 6.3) allowed the original vector base map to be transformed into rasters.

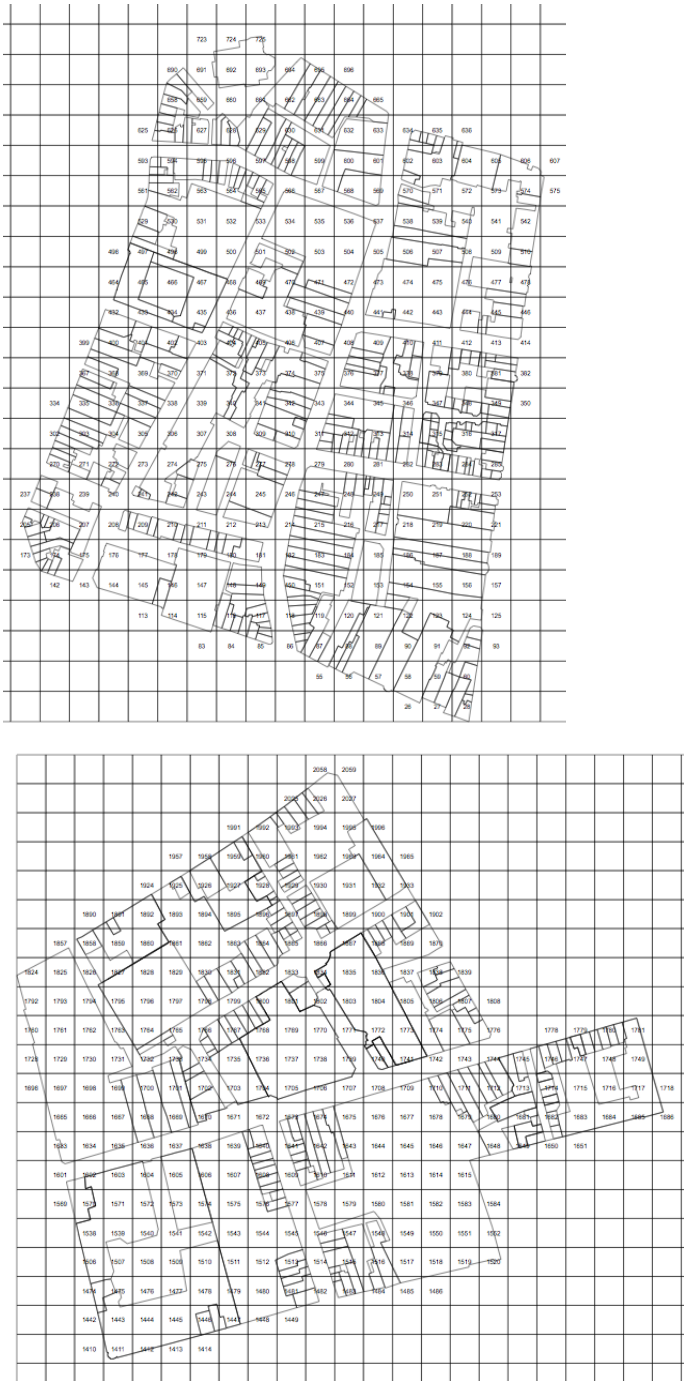


Figure 6.3. The grid-cell matrix for both study areas.

6.2.4 Rasterised urban grain

Advanced spatial analysis based on the measurement of intensity (the number of intersections of plot or parts of plots) provided a single value for each grid cell with the greater the number of intersections, the greater the intensity or fineness of urban grain. It is clear from Figure 6.4 that the rasters provide simplified, objective and powerful representations of the urban grain in the study areas.

Figure 6.4. Raster mapping of urban grain the study areas - Grafton Street area (above) and the Henry Street area (below).

Although the values in both areas range from 1 to 8 (i.e. 1 to 8 intersections or plots or parts of plots in each cell), it is clear that the Grafton Street area had a greater intensity or fineness of urban grain than the Henry Street area. The mean cell values were calculated for both areas and show a strong contrast (Table 6.2). The mean cell value for the Grafton Street area was 3.3, which was almost twice the cell value of the Henry Street area, which was 1.7. This shows that the Grafton Street area was substantially more fine-grained than the Henry Street area. The mean figure for both areas combined was 2.6.

Study area	**No. cells**	**Urban grain**
		Mean cell value
Grafton Street area	299	3.3
Henry Street area	283	1.7
Overall	**582**	**2.6**

Table 6.2. Mean cell values for both study areas.

The raster of the urban grain (Figure 6.4) highlights some interesting contrasts between both areas. The Grafton Street area was clearly more mixed in terms of values, with a preponderance of higher values, when compared with the more homogenous and lower values of the Henry Street area. The highest value cells in the case study areas scored 8 and there were 6 such cells in the Grafton Street area, compared with 1 such cell in the Henry Street area. It was clear that the lower values coincided with more extensive plots and footprints in both areas, such as the shopping centres and malls, department stores and multi-storey car parks. It was also clear that the higher values were associated with the clustering of small, traditional plots in both areas. Notably, the raster picked up the remaining, small clusters of fine urban grain in the Henry Street area (at Liffey Street and Moore Street/Henry Street) and the areas of coarse urban grain in the department stores, shopping malls and multi-storey car park of the Grafton Street area.

6.2.5 Summary of findings for urban grain

The density and grid-based approaches provide alternative measurement techniques for urban grain the study areas. Alternative techniques are necessary as the dependent variable of mix of business is not amenable to measurement using the grid-based approach but is amenable to measurement on a density-based approach. This is important as correlative studies require the variable data in compatible formats.

The density-based approach also provides a simple measure of urban grain (overall net plot density by block) at the case study area and block levels. The measurement can easily be used which can be compared with other studies, with relatively little effort. It is also evident that the density-based approach can also provide the basis for studies for a range of other variables, including land use, activities and other aspects of built form.

The grid-based approach is successful in measuring and identifying urban grain within the study area boundaries and it clearly distinguishes the coarse urban grain of the Henry Street area from the fine urban grain of the Grafton Street area. The rasterised maps simplify the urban grain and provide strong representations of spatial distribution and concentration. Additionally, the mean figure for urban grain drawn from the values of all cells provides a single area-based measure. Importantly, the findings from the grid-based approach reflect the findings of the density-based approach and they clearly distinguish the coarse urban grain of the Henry Street area from the fine urban grain of the Grafton Street area.

6.2.6 Discussion on findings for urban grain

The density and grid-based approaches provide accurate measurements at the area and block level and the fineness of urban grain within the case study areas. The approach to measuring urban grain responds to the concern expressed by Clifton *et al.* (2008) about the difficulties of measurement of urban form at the finest level of resolution and the need for local studies and observations in augmenting secondary sources.

The grid-based approach using GIS has been shown to be successful in its application to urban grain and it supports the view that this approach is suitable in generalising local urban form and managing and evaluating spatial and environmental data in support of land use planning (Pauleit, Ennos and Golding, 2005; Wilson, 2013). The grid-based approach provides a clear picture of the urban grain within the study areas and this is in line with the view of Malczewski (2004) who suggests that raster-based studies are area-oriented rather than boundary oriented. The findings, in providing 'raw' figures for cells, also highlight the benefits of intensity analysis as suggested by Wilson (2013).

While there is no set dimension for grids for local level analysis (Longley and Mesev, 2000), the findings of this research support the appropriateness of the 20x20m grid and its ability to accurately represent local scale features such as land use and aspects of urban form. A larger grid would not have picked up the varieties of plot pattern within urban blocks. A smaller grid system would not have provided a sufficient level of generalisation and would have added greatly to the computation of values. The findings also concur with the pioneering approach and methods of the work of Sekliziotis (1980) as cited by Pauleit, Ennos and Golding (2005) in an area of similar extent in Mereseyside in the 1970s. The findings also support the choice by Bordoloi *et al.* (2013) of the 20x20m grid to analyse land use mix and local transport in a mixed use inner urban setting in India.

The replicability of the approach taken to the measurement of urban grain is a significant feature of the research and an important research outcome in its own right (Yin, 2009). The technique can easily be replicated in almost any urban context wherever basic mapping is available and the resources are available to for basic survey. Additionally, future studies of urban form and urban grain in different contexts and regions could provide the benchmarks necessary to inform future research in this area.

In providing a simple measure for urban grain the research assists in filling a part of the large gap in the knowledge identified by Longley and Mesev, (2001) and Song *et al.* (2013) around generalising and measuring local level urban form and more specifically, it addresses a known gap in the understanding of urban grain as highlighted by Conzen (2001). In presenting a new technique this research also contributes to filling the gap in the range of techniques necessary for connecting urban form and aspects and qualities of the urban environment identified by Ratti and Richens (2004).

6.3 Mix of use and fine urban grain

The claim that fine urban grain plays a beneficial role in fostering mix of uses (also referred to as mixed use or land use mix) is perhaps the most prominent and significant in the literature. It is an almost ubiquitous urban planning objective, with multiple spin-off benefits where needs are met locally by attractive, vital and thriving places, where employment and local services can be sourced and where there is less need to travel (Barton, Grant and Guise, 2010; DETR, 2000; English Partnerships,

2001, 2007). The hypothetical relationship between urban grain, as the independent variable and mix of use as a dependent variable, was included in the conceptual model (Figure 4.1, Chapter 4) for the research. It was noted that the causality of the relationship is based on the connection between the many smaller spaces of the typically smaller buildings of the smaller plots of fine urban grain (Panerai *et al.*, 2004) which results in higher levels of complexity in other elements such as land use (i.e. greater mix of use) (Moudon, 1994).

Although the claims for the benefits of the fine urban grain for mix of use were 'loud and clear' in the literature, the arguments were found to be rhetorical in nature (e.g. Jacobs, 1961; Campbell, 2011) with surprisingly little underpinning evidence. This was considered a significant gap in the knowledge in this area in urgent need of attention. In addressing this gap, a range of techniques were utilised and augmented by a new technique for measuring the intensity of land use mix in more complex contexts such as the urban centre. These were discussed in detail in Chapter 5 (Section 5.2).

6.3.1 Mix of use

The mix of uses in the study areas was determining using a range of established techniques including LUF, land use profile, and LUM. These were augmented by MUI in order to provide the level of advanced spatial analysis demanded by the relatively high level of resolution of urban grain and local land use.

6.3.1.1 Land Use Frequency (LUF)

LUF was used to measure the presence of distinct land use categories in the study areas, within a full range of land use categories. The land use classification system adopted by Dublin City Council included a total of 13 basic land use categories. Combined, there were 9 land use categories in both case study areas. With 9 from a possible 13 land use categories present, the Grafton Street area had a higher LUF than Henry Street, which had 8 from a possible 13 land use categories. This is obviously a very basic analysis of land use mix and it provides no indication of the proportions or mixing of uses within both study areas. While it may be useful at larger urban scales and across larger areas, it is of only worthy of noting in smaller and more complex contexts such as the case study areas.

6.3.1.2 Land use profile

Land use profile, which is the most common and basic form of land use analysis by practitioners, was carried out in both study areas. The basic land use unit was determined as the principal land use on each floor level. Table 6.3 and Figure 6.5 show the breakdown of land uses in both study areas and the combined study areas.

Land use category	Grafton Street area		Henry Street area		Combined areas	
	No. units	%	No. units	%	No. units	%
Residential	78	6	15	5	93	6
Retail	297	25	119	44	416	28
Services	128	11	10	4	138	9
Storage	55	5	6	2	61	4
Professional/Office	424	35	48	17	472	32
Car Park	2	0	0	0	2	0
Education	28	2	2	1	30	2
Community	23	2	1	0	24	2
Miscellaneous	11	1	0	0	11	1
Vacant	161	13	74	27	235	16
Totals	**1207**	**100**	**275**	**100**	**1482**	**100**

Table 6.3. Land use breakdowns for the case study areas.

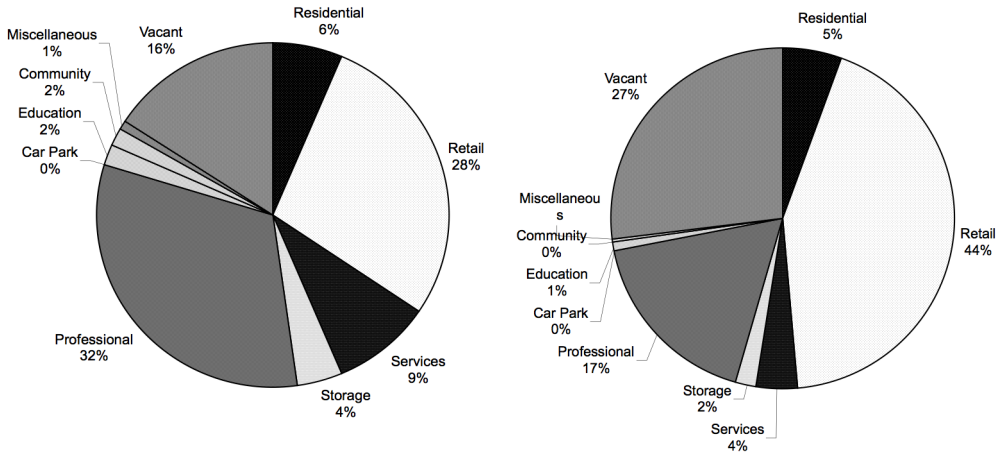


Figure 6.5. Pie charts for land use mix - the Grafton Street area (left) and the Henry Street area (right).

From the tables and figures above it was clear that the fine urban grain of the Grafton Street area was reflected in the high number of land use units recorded there (1207). This contrasted with the low number of land use units recorded in the Henry Street

area (275). It was also apparent that there was a greater mix of land uses in the Grafton Street area than the Henry Street area. Retail and professional uses were clearly dominant in both areas, although retail accounted for 44% of land use units in the Henry Street area (and the highest proportion of any land use in both areas). Professional services were also more prominent in the Grafton Street area with 32% of all land use units when compared with 17% of land use units in the Henry Street area. Residential land use was limited in both areas as might be expected in the prime shopping areas of the city. Miscellaneous, community and education services and storage uses were also limited in both areas, which was indicative of the retail and professional/office specialisation of the area. Some 27% of all units in Henry Street were vacant, compared with 16% of units in Grafton Street. Overall, the use mix in the area reflected the findings of the ground floor, area-wide study in 2012 (Keane, Doyle and Gocur, 2011). A review of land use by floor level was carried out to establish the changing, vertical land use profile. The change between the ground floor and first floor land use profile was particularly striking (Figure 6.6).

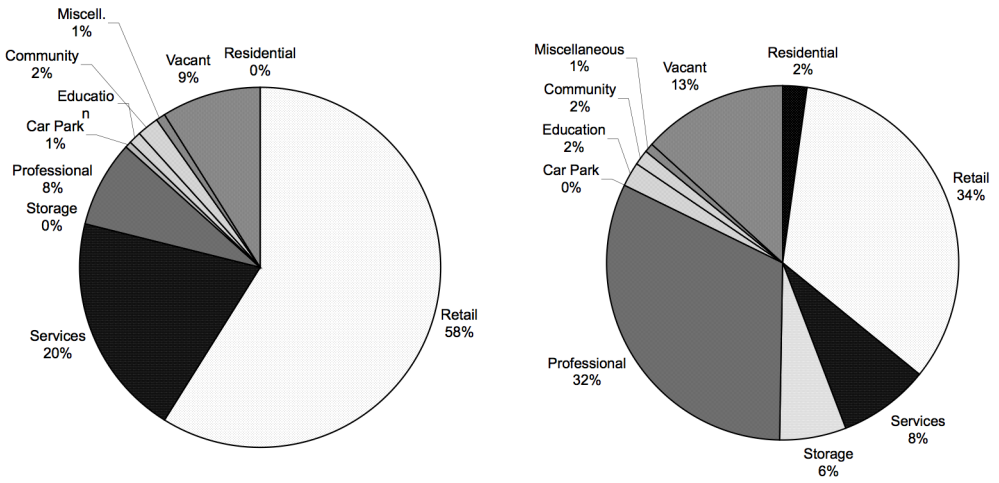


Figure 6.6. Combined areas ground floor (left) versus first floor (right) land use profile in the combined study areas.

From the analysis it is clear that the land use mix was greater at first floor level than it was at ground floor level, where there was a preponderance of retail uses (58%). There was also a significant decline in retail at first floor level (down to 34%), which was almost mirrored by an increase in professional uses (up to 32%). There was a noticeable increase in vacancy at first floor level and it could be seen from the wider analysis that vacancy increased with increasing floor level. The striking contrast in

land use profile at ground floor and first floor highlighted the importance of land use analysis on a floor-by-floor basis in the more complex context of the urban centre.

Land use profile provides a useful picture of land use mix in the study areas, however, it has a number of limitations. Firstly, it is based on the principal use of each floor and this often masks a significant, ancillary or non-principal use in the study areas. Secondly, land use profile does not factor in the scale of the use (i.e. floorspace). As a result, the intensity of land uses in the study areas is not accurately represented (for example, a small, first floor cigar shop occupying the first floor of a building was accorded the same value as a large, ground floor department store). Thirdly, the land use profile provides no indication of the location or spatial distribution of the land uses within the study areas.

6.3.1.3 Land use mapping

The land use mapping for the study areas provides the basic spatial dimension for land use profile in the case study areas. The land use mapping was prepared in vector format based on the land uses categories of the survey for all floor levels. Figures 6.7 and 6.8 show only the land use maps for the ground and first floors of both study areas.

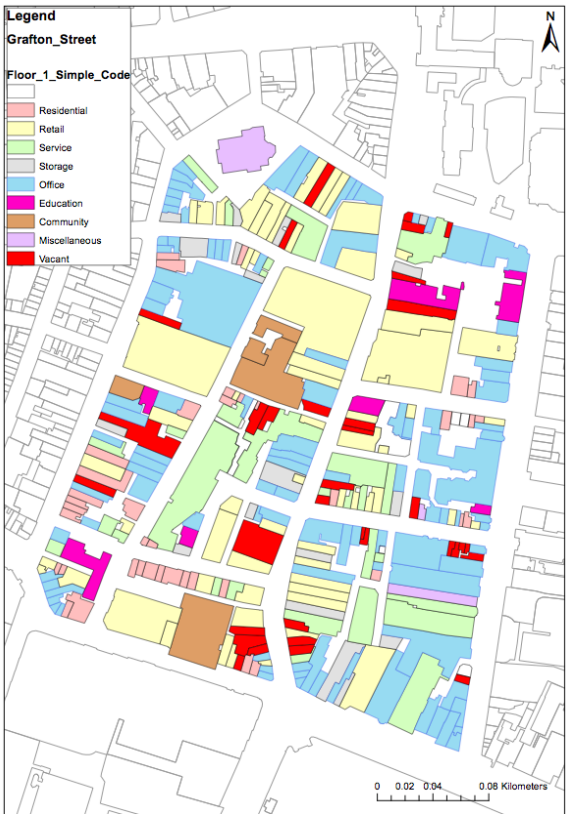
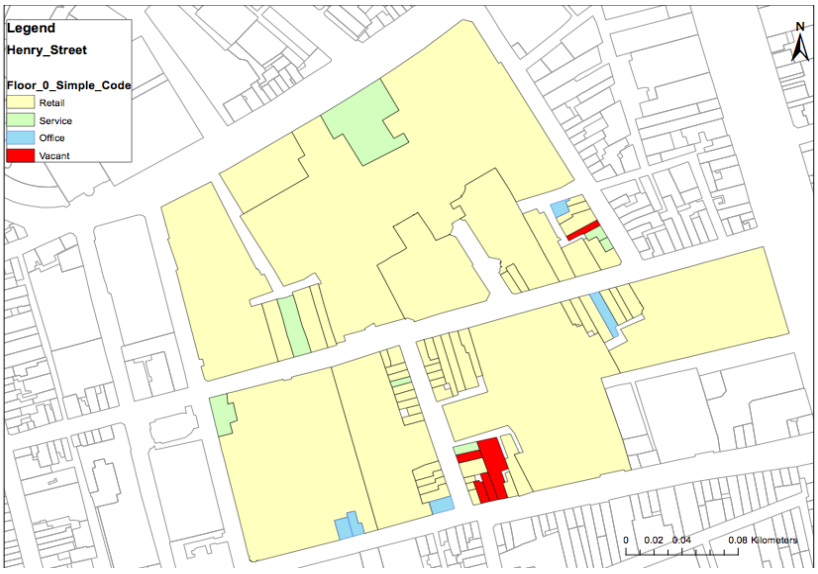


Figure 6.7. Ground floor (previous page) and first floor (above) land use for the Grafton Street area.



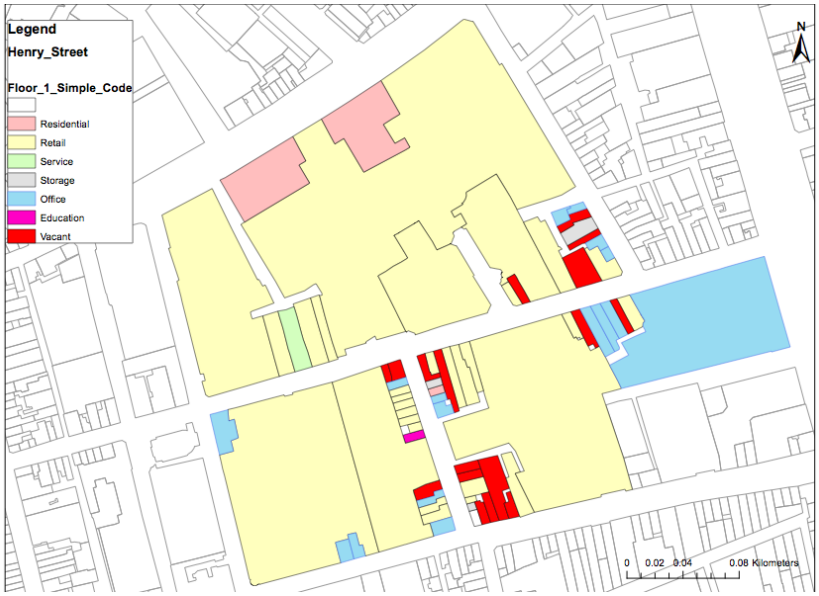


Figure 6.8. Ground floor (previous page) and first floor (above) land use for the Henry Street area.

The mapping highlights the clear contrast in the mix and spatial distribution of land uses between both areas. The Grafton Street area showed a much greater mix and distribution of land use, which reflected the land use profile. The Henry Street area, in contrast, showed a much lesser degree of mix and spatial distribution of land uses. This lack of mix and distribution was perhaps more extensive than the land use profile figures suggested and showed the dominance of the footprints of a few large units in the area.

The mapping also showed the dominance of retail use on the main spine streets of both areas. This reflected the primary and secondary street designations of the City Council (Dublin City Council, 2011). It also showed the increased presence of services and professional/office uses in the secondary streets (particularly in the Grafton Street area). Notably, it showed that the larger scale plots were mostly used for retail purposes, with a greater range of use categories present in smaller plots in both areas. The mapping also reflects the vertical land use profiling, which showed a reduction in retail and an increase in professional/offices between ground floor and first floor levels.

The land use profile and mapping provide a basic descriptive and visual analysis of use mix in the area. More in-depth analysis is required to objectively measure land use mix across the area and to relate it to urban grain.

6.3.1.4 Land Use Mix (LUM)

As discussed in Chapter 5 (section 5.2), Land Use Mix (LUM) was chosen to provide single overall values for land use mix for the study areas. The values were calculated by applying an entropy model to the land use data. This provided values between 0.0 and 1.0 with higher values representing greater mix of use. The results are shown in Table 6.4

Case study	LUM Value	Benchmark 1	Benchmark 2
		Song *et al.* (2013)	Musakwe and Niekerk (2012)
Grafton Street area	0.71	Towards the maximum observed figures (0.80-0.83).	High use mix category – middle of range (0.61-0.80)
Henry Street area	0.53	Below the mean figures (0.54-0.58)	Average use mix range category – higher end of range (0.41-0.60)

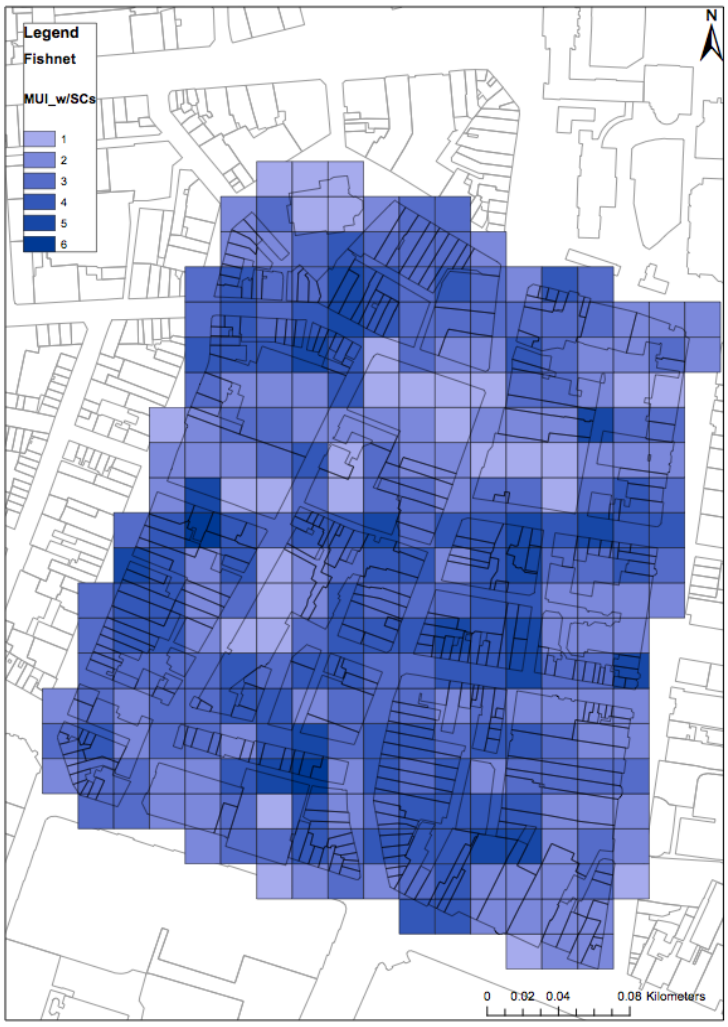
Table 6.4. LUM for the study areas using the entropy model.

The figures in Table 6.4 show medium to high values as might be expected in a typically mixed use urban centre. However, the results contrast significantly when they are compared against benchmarks for other LUM studies (albeit applied to different scales, contexts and land use categories). The analysis clearly shows that the Grafton Street area had a high LUM when benchmarked against similar studies (Song, Popkin and Gordon-Larsen, 2013; Musakwe and Niekerk, 2012). In contrast, the Henry Street area could have been described as having an average or slightly below average LUM when benchmarked.

LUM provides a useful, single reference figure for mix of use in the study areas and it clearly shows contrasting results for the Grafton Street and Henry Street areas. However, as already discussed in Chapter 5 (Section 5.2), this technique has it limitations. LUM does not provide a picture of the spatial distribution of use mix within the study area boundaries and a higher level of spatial analysis is required to achieve this.

6.3.2 Mixed Use Index (MUI)

As discussed in detail in Chapter 5 (Section 5.2), MUI was developed as a bespoke technique for this research to provide advanced spatial analysis at the level of detail and the scale of the individual plot. The analysis of the intensity of land use mix was facilitated by rasterisation. A single value of the intensity of land use mix was established for each cell with darker tones indicating greater intensity of land use mix (Figure 6.9).



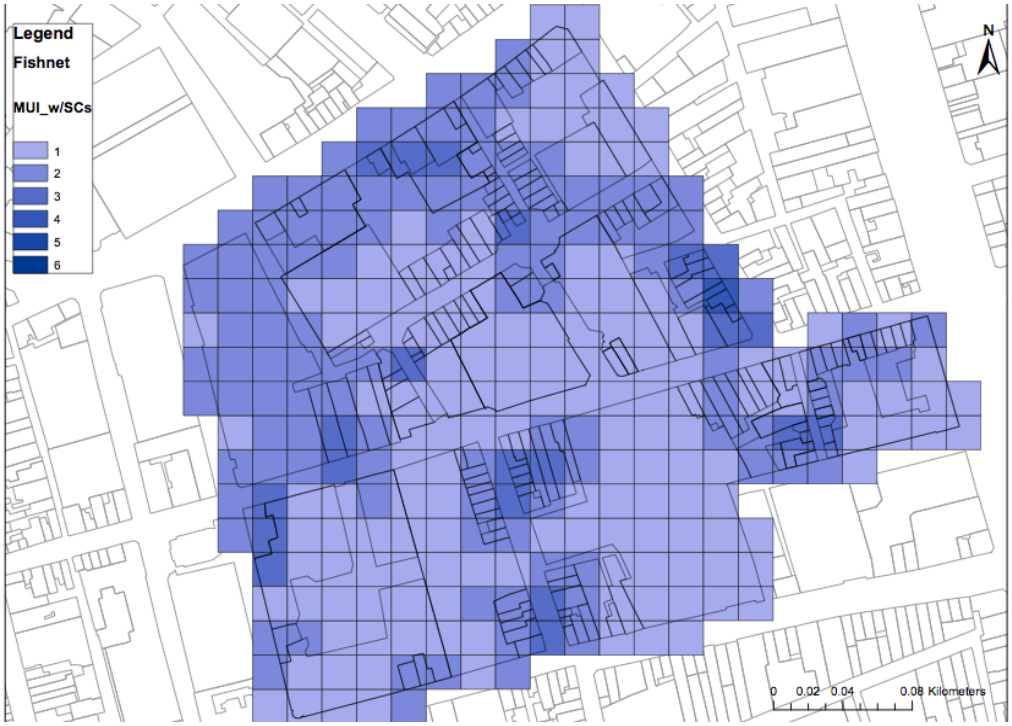


Figure 6.9. MUI for the Grafton Street area (previous page) and the Henry Street area (above).

The contrast between the MUI mapping in both study areas is striking. The rasters clearly show that the Grafton Street area had a greater intensity of mix of use than the Henry Street area. While MUI values (intersections of distinct land uses over all floors levels in each cell) ranged between 1 and 6 in the Grafton Street area, the equivalent range in the Henry Street area was between 1 and 4. The mean values for all cells in both study areas show that the Grafton Street area had a value of 2.9 (in other words an average of 2.9 different land uses in each cell), which was almost twice that of the Henry Street area, which had a value of 1.5 (in other words an average of 1.5 different land uses in each cell). The overall mean figure for both study areas combined was 2.4 (Table 6.5).

Study area	**No. cells**	**MUI**
		Mean cell value
Grafton Street area	299	2.9
Henry Street area	283	1.5
Overall	**582**	**2.4**

Table 6.5. Mean cell values for MUI in both study areas.

The rasters of MUI (Figure 6.9) highlight some interesting spatial contrasts between both areas. The Grafton Street area was clearly mixed in terms of values, with a

preponderance of higher values, when compared with the more homogenous and lower values of the Henry Street area. The highest value cell in the Grafton Street area was 6 and there were 2 such cells. The maximum value in the Henry Street area was 4 and there was only one such cell. It was clear that the lower values coincided with more extensive plots and footprints in both areas, such as the larger units of shopping centres and malls, department stores and multi-storey car parks. It was also clear that the higher values were associated with the clustering of small, traditional plots in both areas.

Although values were significantly lower across the Henry Street area, it was apparent that the remaining, small clusters of fine urban grain (at Liffey Street and Moore Street/Henry Street) and the small unit shops of the ILAC Mall had relatively higher values. The case of the ILAC Mall is particularly interesting in that it is considered an outdated typology because of its small unit size, and it contrasts, for example, with the nearby and much larger units sizes and lower values in the Jervis Street Shopping Centre. In the Grafton Street area, values were higher across the area, and it was apparent that higher values were clustered around the finer urban grain of the area, in contrast to the lower values, which were clustered in the areas of coarse urban grain in the department stores, shopping malls and the multi-storey car park.

As with the rasterisation of urban grain, values at the edge of both study areas could have been affected by the boundary, although this does not appear to be a major factor in this analysis as the boundaries do not coincide with adjoining plots (the boundaries are at streets and open spaces). Notably, MUI appears to have been successful in providing a detailed analysis of the spatial distribution of the 3-dimensional mix of land uses in the area. MUI also demonstrates that the common 20x20m grid is effective at this scale and appropriate to the complexities of urban grain.

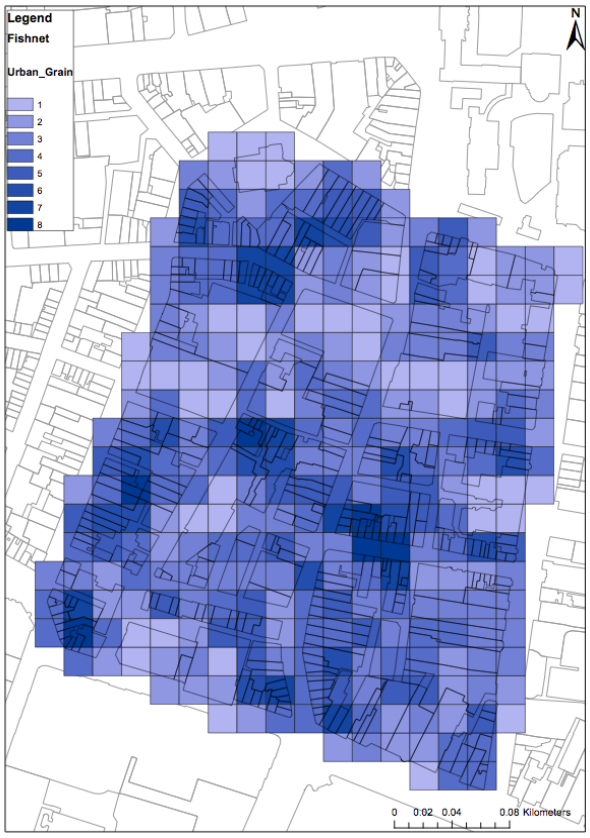
6.3.3 Land use mix and the fine urban grain

The strength of the relationship between urban grain and land use mix was evaluated using Pearson's Correlation Coefficient. As set out in the conceptual model for the research (Chapter 4, Figure 4.1) urban grain was treated as the independent variable and land use mix was treated as the dependent variable. The correlative analysis is supported by descriptive statistical analysis of associations and clusters.

Technique	Grafton Street area	Henry Street area	Combined case study areas
Pearson's correlation coefficient value	0.66	0.38	0.67
Strength of correlation	Strong	Moderate	Strong

Table 6.6 Correlation of urban grain and mix of uses.

Table 6.6 shows a strong relationship between the land use mix and urban grain for the both study areas combined (when the data for both areas were considered together to form a larger dataset) with a positive value of 0.67. It also shows a strong correlation between land use mix in the Grafton Street area, with a positive value of 0.66. The Henry Street area value was lower with a moderate strength of correlation with a positive value of 0.38.



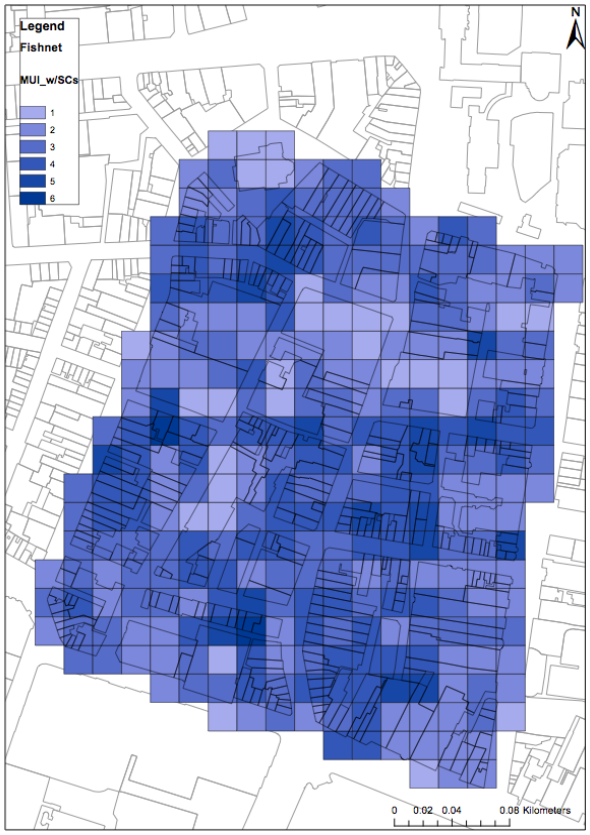
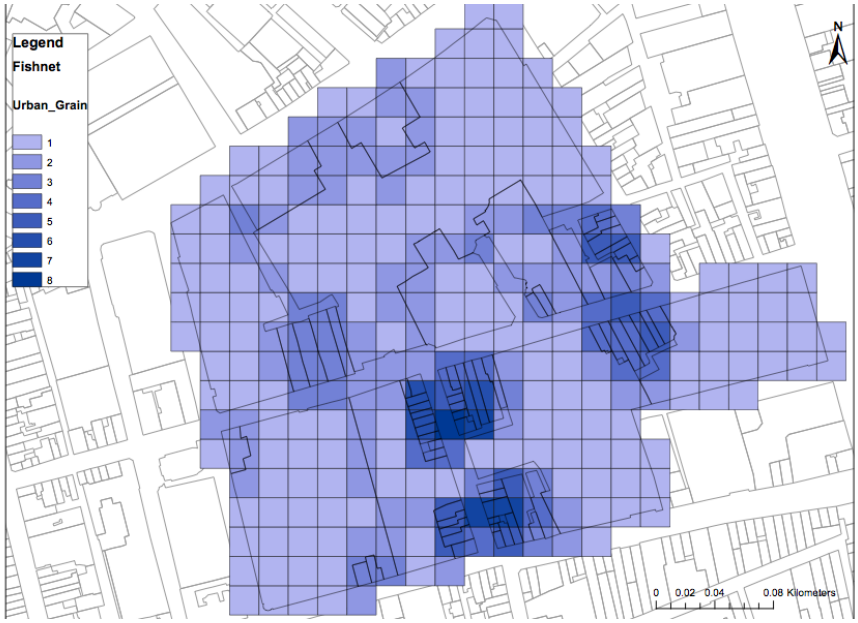


Figure 6.10. Rasters of urban grain (previous page) and MUI (above) for the Grafton Street area.



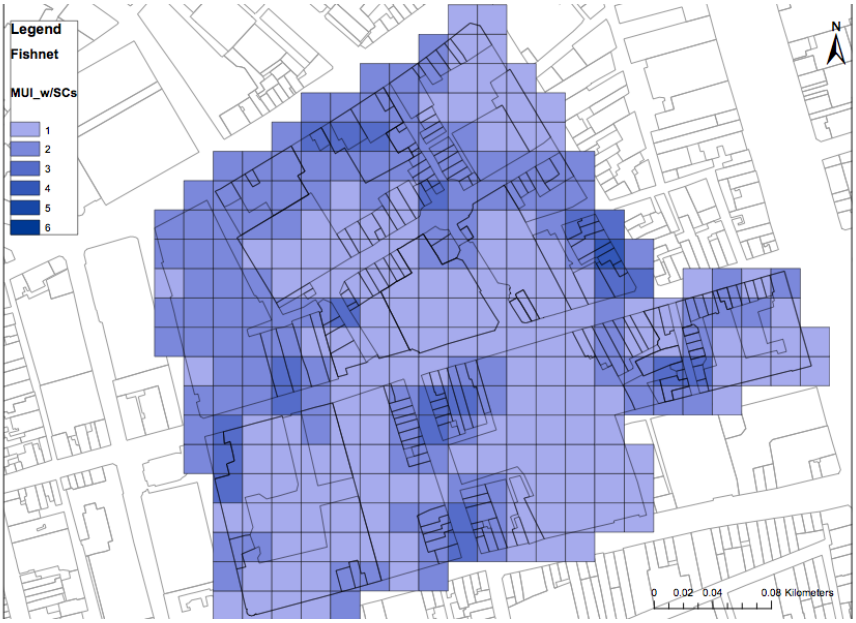


Figure 6.11. Rasters of urban grain (previous page) and MUI (above) for the Henry Street area.

The mapping provides a visual representation of the correlations (Figures 6.10 and 6.11). In both areas the patterns of intensity of land use mix and urban grain are closely matched (note that values are not the same in the studies). In both areas clusters of fine urban grain are closely matched with clusters of greater mix of uses and clusters of coarse urban grain are closely matched with clusters lower mix of uses. The lower figure for the correlation in the Henry Street area may reflect the inclusion of mix of use within the ILAC centre and along the Parnell Street frontage, where lower values would have been returned to match lower urban grain values, if less detailed land use mapping was used.

6.3.3.1 Analysis of patterns and trends

A descriptive approach to the analysis of associations and segments of similar behaviour between land use mix and urban grain was carried out based on the grid cell data. In this analysis both mode and average of land use mix intensity were considered against the different categories (intensities) of urban grain.

Looking at the Grafton Street area, the mode ranged between 1 and 4 uses per urban grain category (ranging 1 to 8) with a mode of 3 for all urban grain categories (Figure 6.12). An average of 2.90 was observed for all urban grain types (ranging 1 to 8) (Figure 6.13). Looking at mode and average, it is observed that the trend follows a pattern of a finer urban grain leading to a higher number of mixed uses. When a

linear trend is fitted to the data series a positive trend emerges, leading to the conclusion that finer urban grain is indicative of a greater mix of use.

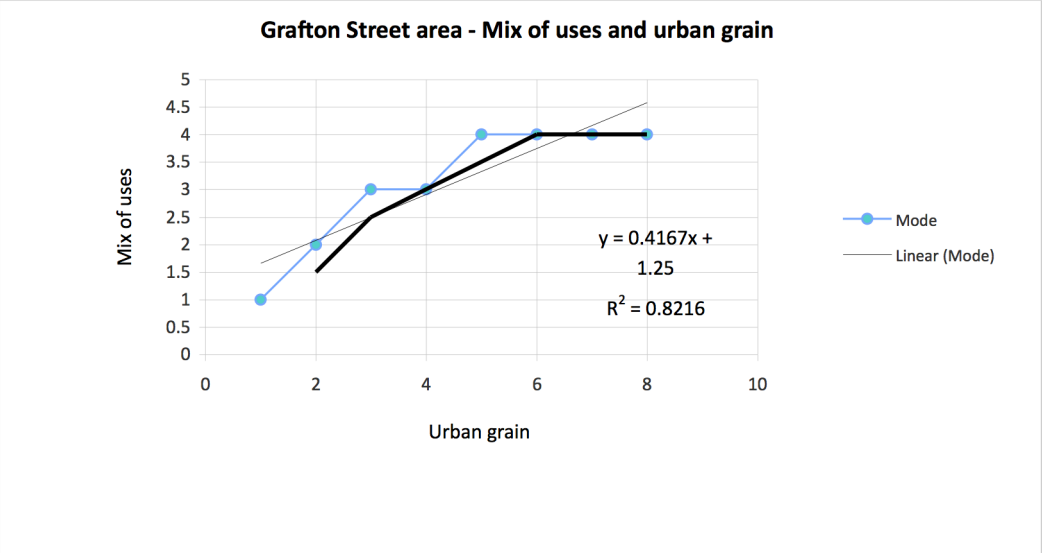


Figure 6.12. Linear and moving average trend analysis of the most common number of uses for each grain type in the Grafton Street area.

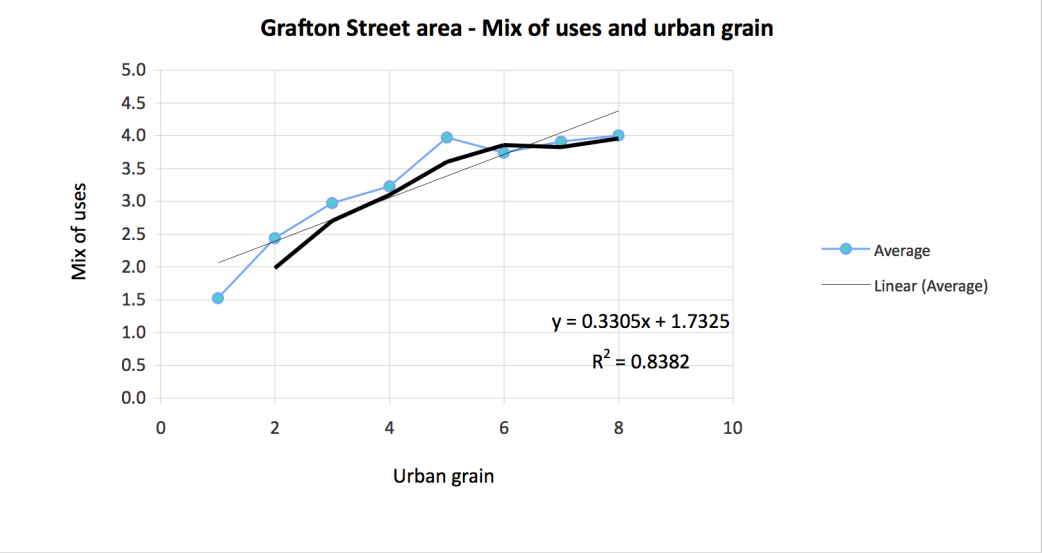


Figure 6.13. Linear and moving average trend analysis of the average number of uses for each grain category in the Grafton Street area.

Looking at the Henry Street area, the mode ranged between 1 and 3 uses per urban grain category (ranging 1 to 8) with a mode of 1 for all urban grain categories (Figure 6.14). An average of 1.55 was observed for all urban grain types (ranging 1 to 8) (Figure 6.15). Looking at mode and average, it is observed that the trend follows a

pattern of finer urban grain leading to greater mix of use. When a linear trend is fitted to the data series a positive trend emerges, leading to the conclusion that finer urban grain is indicative of a higher number of uses.

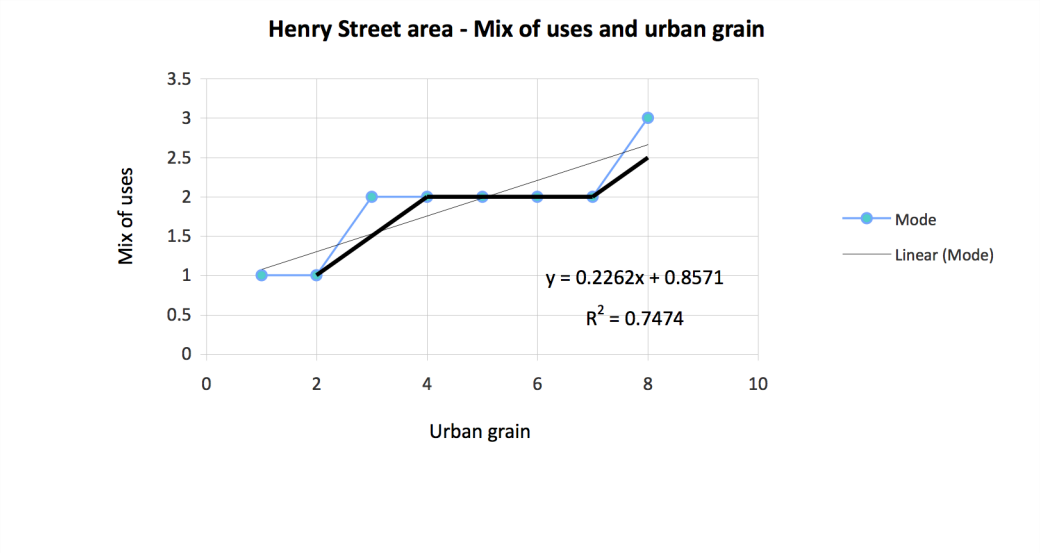


Figure 6.14. Linear and moving average trend analysis of the most common number of uses for each grain type in the Henry Street area.

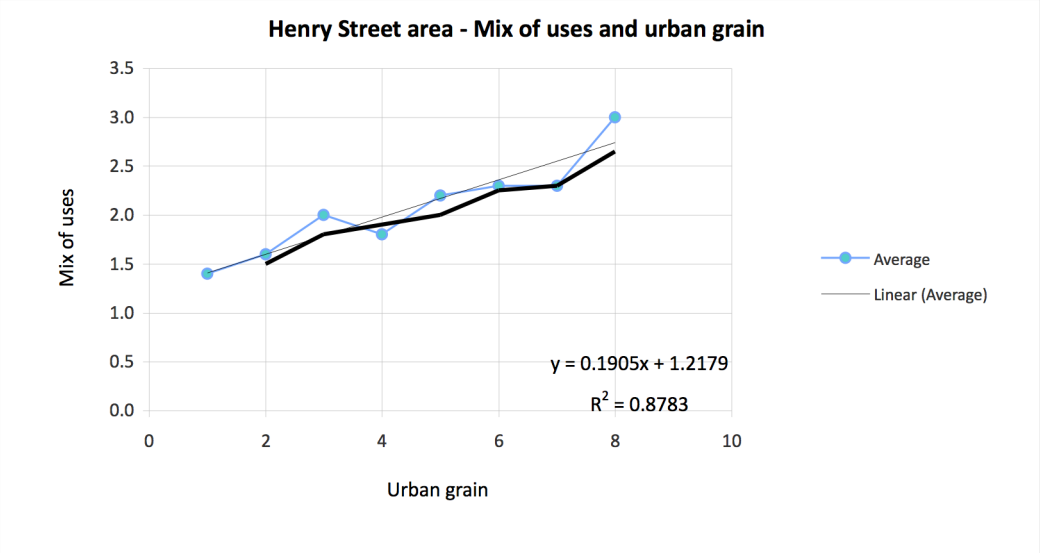


Figure 6.15. Linear and moving average trend analysis of the average number of uses for each grain type in the Henry Street area.

In looking at the combined study areas the mode ranged between 1 and 4 uses per urban grain category (ranging 1 to 8) with a mode of 2 for all urban grain categories (Figure 6.16). An average of 2.24 was observed for all urban grain types (ranging 1

to 8) (Figure 6.17). Looking at mode and average, it is again observed that the trend follows a pattern of a finer urban grain leading to a higher number of mixed uses. When a linear trend is fitted to the data series a positive trend emerges, leading to the conclusion that finer urban grain is indicative of a higher number of uses.

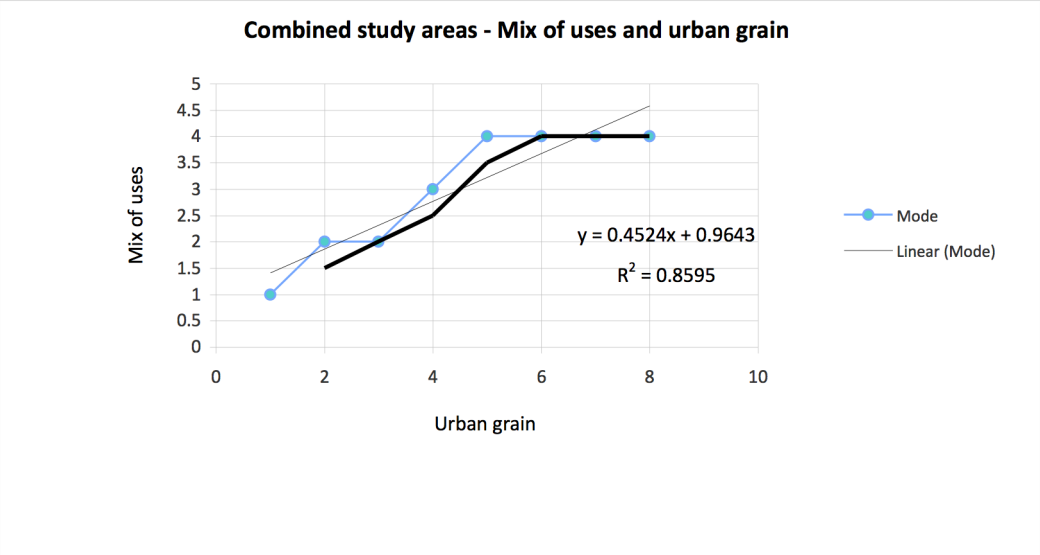


Figure 6.16. Linear and moving average trend analysis of the most common number of uses for each grain type in the combined study areas.

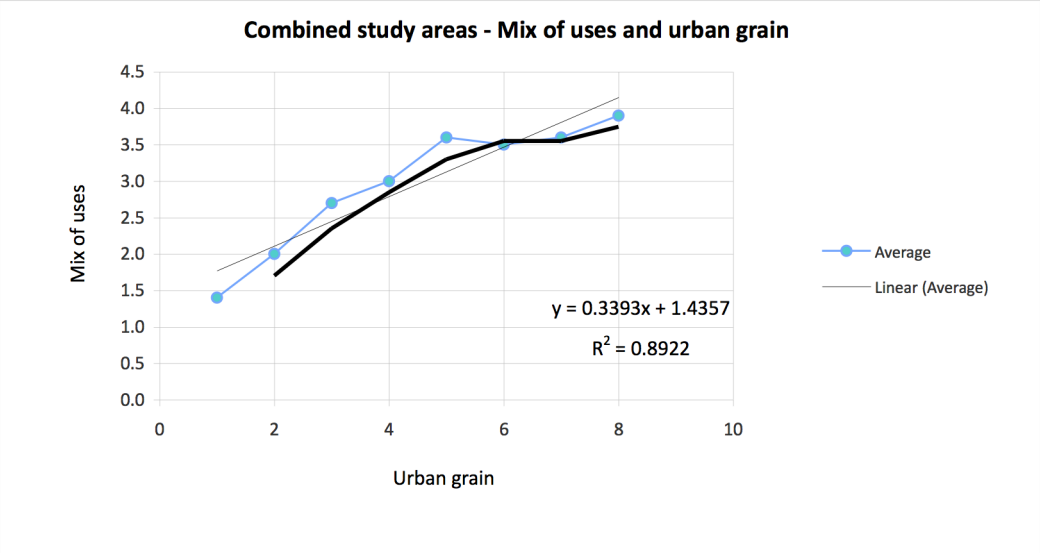


Figure 6.17. Linear and moving average trend analysis of the average number of uses for each grain type in the combined study areas.

The descriptive statistics all show positive trends towards higher values for land use mix with higher values for urban grain. Although values for land use mix and urban grain are lower overall in the Henry Street area than the Grafton Street area, the trend

lines are very similar in nature, leading to the conclusion that the relationship between these two variables is strong. This is further supported by the similarity of the trend line for the combined study areas.

6.3.4 Summary of findings for mix of use and urban grain

The principal findings for the mix of use and urban grain are that:

- The model developed for measuring the intensity of land use mix on a grid basis was appropriate, robust and compatible with similar models for measuring land use mix and urban grain;
- On a case study area basis, there was a demonstrable relationship between the fineness of urban grain and greater levels of land use mix. The case study area with finer urban grain (Grafton Street area) had a greater mix of uses than the coarse grain study area (Henry Street area), when considering land use profiles and mean values for LUM and MUI;
- There was a strong correlation between the intensity of urban grain and mix of uses in the Grafton Street area and for both study areas combined and a moderate relationship in the Henry Street area; and
- The supporting descriptive statistical analysis showed a strong relationship between land use mix and urban grain in the Grafton Street area, the Henry Street area and the combined study areas.

On the basis of the findings it can be stated that the hypothetical relationship outlined in the conceptual model is confirmed as strong and true. Accordingly, the hypothesis outlined in the conceptual model, 'That fine urban grain leads to greater mix of uses than coarse urban grain' is accepted.

6.3.5 Discussion on mix of uses and urban grain

The findings support the effectiveness of the entropy-based models deployed in land use mix models (Musakwe and Niekerk, 2012; Song, Popkin and Gordon-Larsen., 2013). The findings also show that the relative benchmarking is useful and can be used across different geographies and urban context and scales, subject to proper checks. The findings also highlight the value and effectiveness of using the correlative analysis deployed by Song, Popkin and Gordon-Larsen (2013) in measuring the mathematical of strength of relationship between the variable of urban grain and mix of use in the urban centre.

The findings highlight the ability of MUI to address the limitations of current techniques for measuring mix of uses. As seen from the land use profile, ground floors and upper floors vary greatly in the typical urban centre, whereas most land use mix techniques are 2-dimensional, in that they consider only ground floor use or principal use of all floors. The 2-dimensional approach typically provides a much lower value for mix of uses, thus misrepresenting the true mix of use, particularly in the urban centre.

The findings provide a useful reference for the research of Pafka (2013), who used a new system of Functional Constellation Mapping (FCM) to correlate land use mix and aspects of urban land use at the local level. In looking at a number of CBDs, he found that mix of use was greater where urban form patterns, such as the finer urban grain, were smaller in scale and more irregular. Pafka's published work has not to date been supported by detailed statistical analysis.

The findings underpin normative and unsupported claims stretching back to Jacobs (1961), who identified the important role of the mixed use in the sustaining the city, the close relationship between built form and mix of use and the major contribution of fine urban grain (then referred to as smaller properties with short frontages) in accommodating the smaller, secondary uses of the local city economy. These findings provide empirical support for this rhetoric. The findings also support the connection made by Alan Jacobs (1993) between mix of uses, fine urban grain and the role that it plays in securing a range of local socio-economic benefits. It also contributes to meeting his call for more evidence-based research on the benefits of fine urban grain.

An important claim is made in the literature connecting fine urban grain with urban regeneration. Coupland (1997) and Roberts and Lloyd-Jones 1997) both claim that fine urban grain attracts and retains a wide range of uses, which are essential to the regeneration of urban centres. Pitts (2004) also argues that fine urban grain is a provider of the smaller scale buildings necessary to host the numerous smaller scale uses and activities on which successful regeneration depends. Similarly, Montgomery (2003) asserts that fine urban grain plays a particularly important role in securing the mix of uses and activities necessary for culture-led urban regeneration. However, all of these claims have been undermined by their normative basis and the lack of robust underpinning evidence. As the findings confirm the relationship

between mix of uses and urban grain, it could be argued, by extension, that fine urban grain makes a contribution to urban regeneration. Although it should be stressed that the connection made in the literature between fine urban grain and urban regeneration is largely based on rhetoric and heuristics.

The findings also support the statements in current planning and urban design guidance which link mix of uses with fine urban grain. DETR (2000) and English Partnerships (2000, 2007) provide endorsements of fine urban grain on the basis of its mix of use benefits. English Partnerships (2000) advises practitioners to keep plots small and narrow to encourage, among other things, diversity of uses and activities. This guidance was not underpinned by evidence and appears to have had little impact on practice. The findings now provide an evidence basis for the guidance, which could improve its traction in practice.

The findings also support recent urban design manuals for practitioners, which deal with urban grain. Tarbatt (2012) bases his manual entirely on simple assumptions and premises. No empirical evidence is provided to support the claimed benefits of fine urban grain. Notably, he connects fine urban grain with mix of uses on the high street. These findings are particular apt for his work and his assumptions given that they relate specifically to the urban centre.

Campbell (2011) proposes a theorem based on patterns that are akin to those propounded by Alexander (1977). In this he states that fine urban grain is a prerequisite to mix of uses. However, the findings indicate that the notion of fine urban grain as a requisite for mix of uses must be rejected as mix of uses does occur in coarse urban grain in the urban centre, albeit at a significantly lower level than in the fine urban grain.

The findings could support the claim that a loss of fine urban grain in the urban centre through redevelopment leads to the destruction of mix of uses in an area (Campbell, 2011; Monteiro and Knight, 2012). The findings clearly show that coarse urban grain performs significantly worse in terms of mix of uses than fine urban grain (the ILAC centre is a particular case in point), although the use of the term ‘destruction’ exaggerates the nature of the loss.

The findings confirm the hypothesised relationship between fine urban grain and greater mix of uses as set out in the conceptual model for the research (Chapter 4, Figure 4.1). They provide the much-needed empirical backing for the rhetoric, intuition and normative stances, which have dominated the discussion in this area. The findings on mix of uses and urban grain provide new evidence to help to fill the knowledge gap around fine urban grain. The underpinning of the claim with evidence will serve to support the claims and deepen their influence in policy and practice.

6.4 Mix of ownership

As discussed in Chapter 2, a significant claim in the literature relates to the role of fine urban grain in providing a mix of ownership. This is a substantial claim as mix of ownership is a commonly cited objective in studies on the urban centre (NEF, 2010; Portas, 2011). It is also considered a key aspect of diversity, which is a key component of urban theory and current planning policy for the urban centre (CLG, 2012a; DECLG, 2012a). Despite the prominence of the claims in the literature, the underpinning evidence for them was found to be surprisingly sparse and represented a gap in the knowledge in this area. The claims were based on heuristics such as observation of particular cases or experiential knowledge (e.g. Jacobs, 1993; Montgomery 2003; McNeill, 2013).

The hypothetical relationship between urban grain, as the independent variable, and mix of ownership as a dependent variable, was included in the conceptual model for the research (Figure 4.1, Chapter 4). McNeill (2011) explores the cause and effect of the relationship and he suggests that the small spaces that small businesses require and can afford are available in fine urban grain in the city centre and that these businesses tend to be independently-owned. Thus, the preponderance of independent ownership delivers mix of ownership.

As detailed in Chapter 5 (Section 5.2), the methodology provided for the collection of details of proprietary ownership, broken down in accordance with the normal categories of either independent or multiple/chain ownership. A grid-based approach was adopted as it provided a good degree of accuracy and was compatible with the approach taken to urban grain and land use mix. The internal ownership patterns within the malls and shopping centres were included in the analysis to give a better indication of the pattern of ownership.

6.4.1 Profile of ownership

The data were collected for the principal ownership at ground floor and principal ownership for the combined upper floors. The combined upper floors were profiled as it became apparent during the survey that there was a change in business ownership between ground and upper floors, and recording only principal ownership for each plot would not have accurately reflected the diversity of ownerships in the study areas. Vacant floor levels were excluded from the calculations. The data were profiled using tables and pie charts (Table 6.7 and Figures 6.18 and 6.19).

Principal ownership	Grafton Street area		Henry Street area		Combined areas	
	Indep.	Chain	Indep.	Chain	Indep.	Chain
Ground floor (%)	44	56	4	96	24	76
Upper floors (%)	47	53	7	93	27	73

Table 6.7. Ownership type at ground floor level in the study areas.

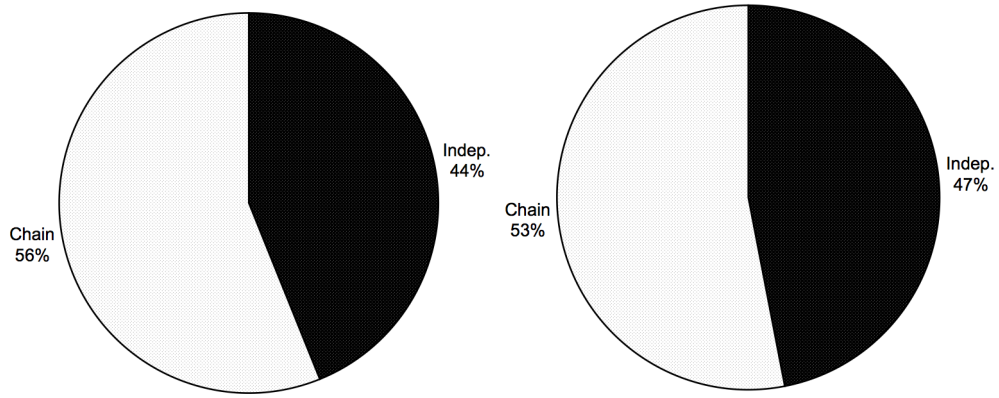


Figure 6.18 Ground floor (left) and upper floor (right) ownership in the Grafton Street area.

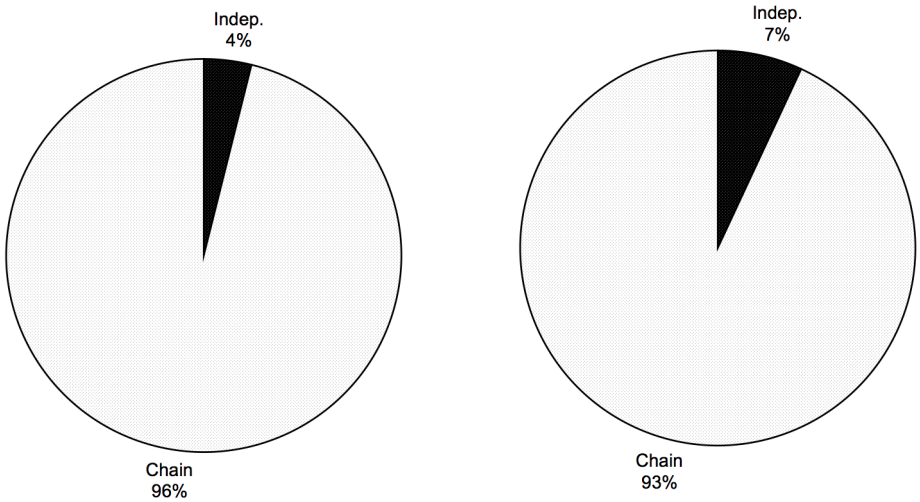


Figure 6.19 Ground floor (left) and upper floor (right) ownership in the Henry Street area.

The figures show that multiple or chain ownership was the dominant ownership in both study areas, accounting for some 76% of all units at ground floor and 73% of all upper floor units. A marginal decline in multiple/chain ownership in the upper floors, reflected the presence above some multiples of smaller independent businesses (such as dentists and offices), although it was noted that multiple/chains generally tended to retain the upper floors of buildings for ancillary storage or office use. It was also clear that vacancy was common in the upper floors of many ground floor multiple/chains reflecting a trend. This was also noted during the land use survey. From the survey it was also clear that multiples or chains were not present above independently-owned ground floor businesses and it was clear that multiple and chain businesses clearly had a preference for ground floors.

There was a striking difference in the ownership patterns of the study areas. Independent ownership was much higher in the Grafton Street area (44% at ground floor level and 47% at upper floors) than in the Henry Street area (just 4% at ground floor level and 7% at upper floors). The figures suggest that the larger buildings and units of the Henry Street area were more suited to the larger scale and better-resourced multiple/chain businesses. It could also be suggested that the smaller buildings and units of the Grafton Street area were more suited to the smaller scale and, it is assumed, the more modestly resourced, independent businesses.

6.4.2 Spatial analysis of ownership

The data were mapped and rasterised (Figures 6.20 and 6.21) to provide a spatial dimension to the figures. The strong dominance of multiple/chain ownership in the Henry Street area was apparent at all levels with independent ownership occurring only in small pockets in the remnant fine urban grain clusters and in the small units of the ILAC centre. The modest change in the balance of ownership at upper floors level is evident in the mapping.

In contrast, the Grafton Street area presented a relatively balanced mix of ownership. The spatial pattern at ground floor level was striking; chain/multiple ownership was clearly focused on the main shopping spine of Grafton Street and the adjoining secondary streets. Independent ownership was dominant on the secondary streets, notably the parallel streets of South William Street and Dawson Street. The mapping for Grafton Street indicates that primary retail frontage and location rather than the particular nature of the urban grain is a stronger influence on ownership in the case of these retail cores.

Figure 6.20. Maps showing mix of ownership for the ground floor (above) and upper floors (below) in the Grafton Street area.

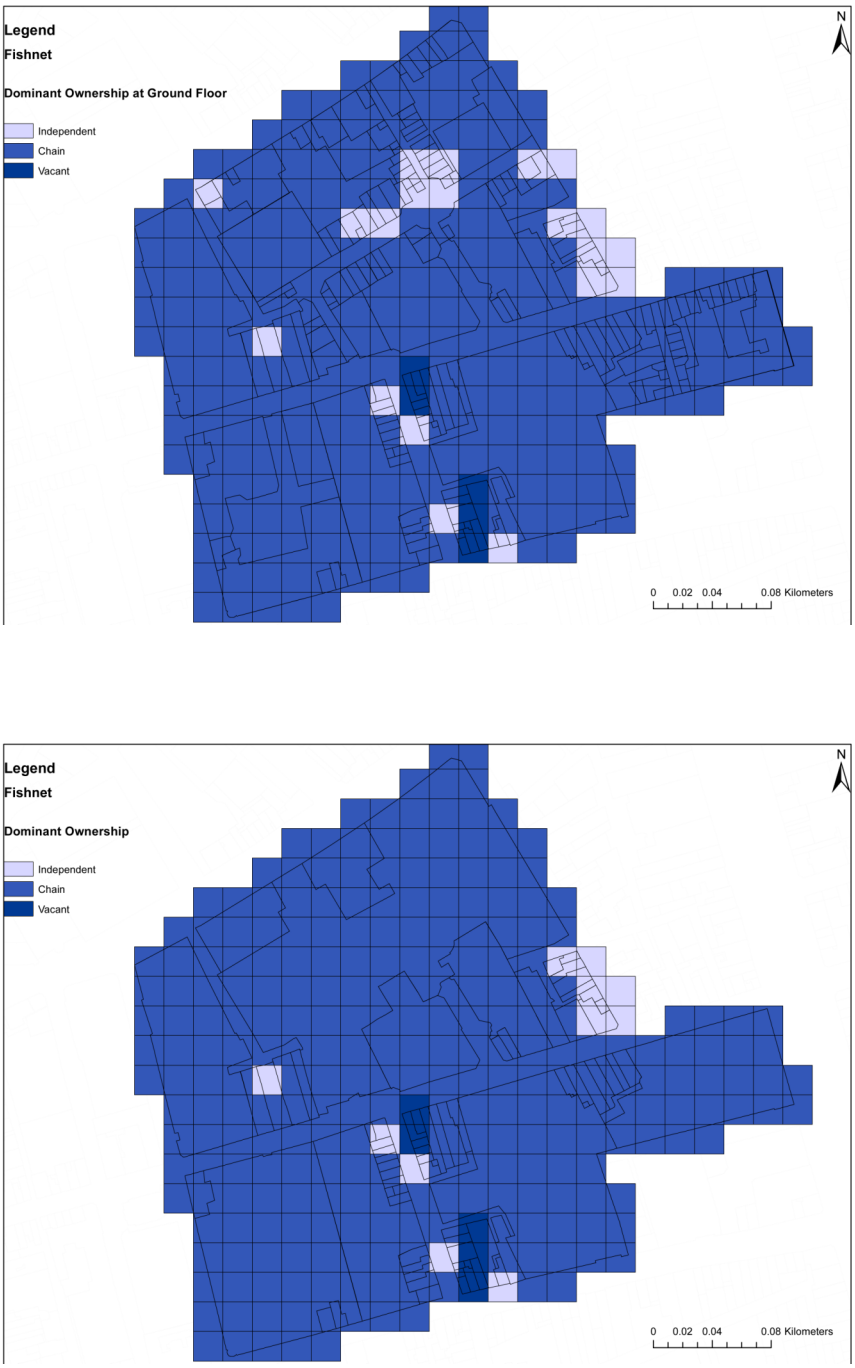


Figure 6.21. Maps showing mix of ownership for the ground floor (above) and upper floors (below) in the Henry Street area.

6.4.3 Ownership and urban grain

The description and the quantitative measurement of the strength of the relationship between urban grain and ownership was established with reference to best practice in this area (Strathclyde University, 2015) and using Pearson's Correlation Coefficient.

Technique	Grafton Street area		Henry Street area		Combined case study areas	
	Ground floor	Upper floors	Ground floor	Upper floors	Ground floor	Upper floors
Pearson's correlation coefficient value	-0.05	-0.01	-0.09	-0.01	-0.21	-0.17
Strength of correlation	Weak	Weak	Weak	Weak	Modest	Modest

Table 6.8 Correlations between mix of ownership and urban grain.

The analysis in Table 6.8 shows weak correlations between ownership and urban grain in the Grafton Street area, with negative values for principal ground floor and upper floors ownership. The analysis shows similarly weak correlations between ownership and urban grain in the Henry Street area, with negative values for ground floor and upper floors ownership. The negative correlations were slightly stronger and considered as modest for both study areas combined.

The negative correlations were surprising given that the area-wide analysis showed that the finer grain area had a much greater proportion of independent business than the coarser grain area. In part, this may result from the limitations of the rasterisation of the ownership mapping, for which it was not possible to get accurate footprints. A more detailed survey would require internal building survey with a more detailed base map of ground and upper floor footprints and this was beyond the scope and resources of this research. However, it seems likely that other variables that were closely related to the diversity of primary and secondary streets of shopping cores are at play, such as accessibility, rental values and the preference of chain/multiple retailers for primary street frontage at areas of high footfall.

6.4.3.1 Analysis of patterns and trends

A descriptive approach to the analysis of associations and segments of similar behaviour between ownership and urban grain was carried out based on the grid cell data to support the correlations. In looking at the Grafton Street area, the mode was multiple/chain (value of 1) for both ground floor and principal upper floor ownership. The average for ground floor ownership was 1.48 and 1.47 for principal upper floor ownership, indicating a close balance between independent and multiple/chain

ownership (values between 1.0 and 1.49 indicated chain/multiple ownership dominance and values between 1.50 and 2.0 indicate independent ownership dominance). Figure 6.22 shows that ground floor and upper floors ownership trends for the mode follow almost the same positive pattern. When linear and moving average trends for the ground floor are fitted to the data series a positive relationship emerges leading to the conclusion that a finer urban grain is indicative of higher levels of independent ownership. A similar trend is evident for ground floor and upper floor averages (Figure 6.23).

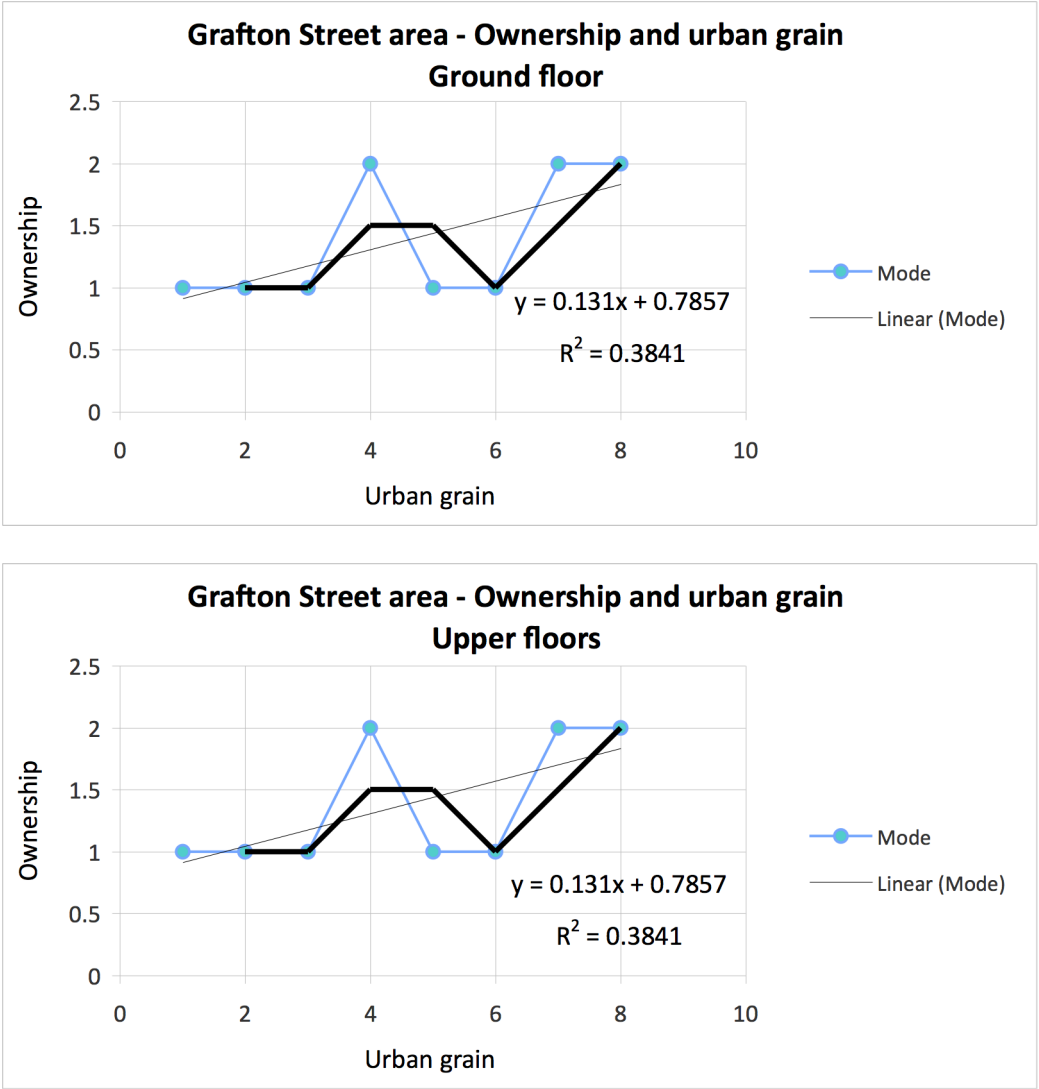


Figure 6.22. Linear and moving average trend analysis of the most common number of uses for each grain type for the ground floor (above) and upper floors (below) in the Grafton Street area.

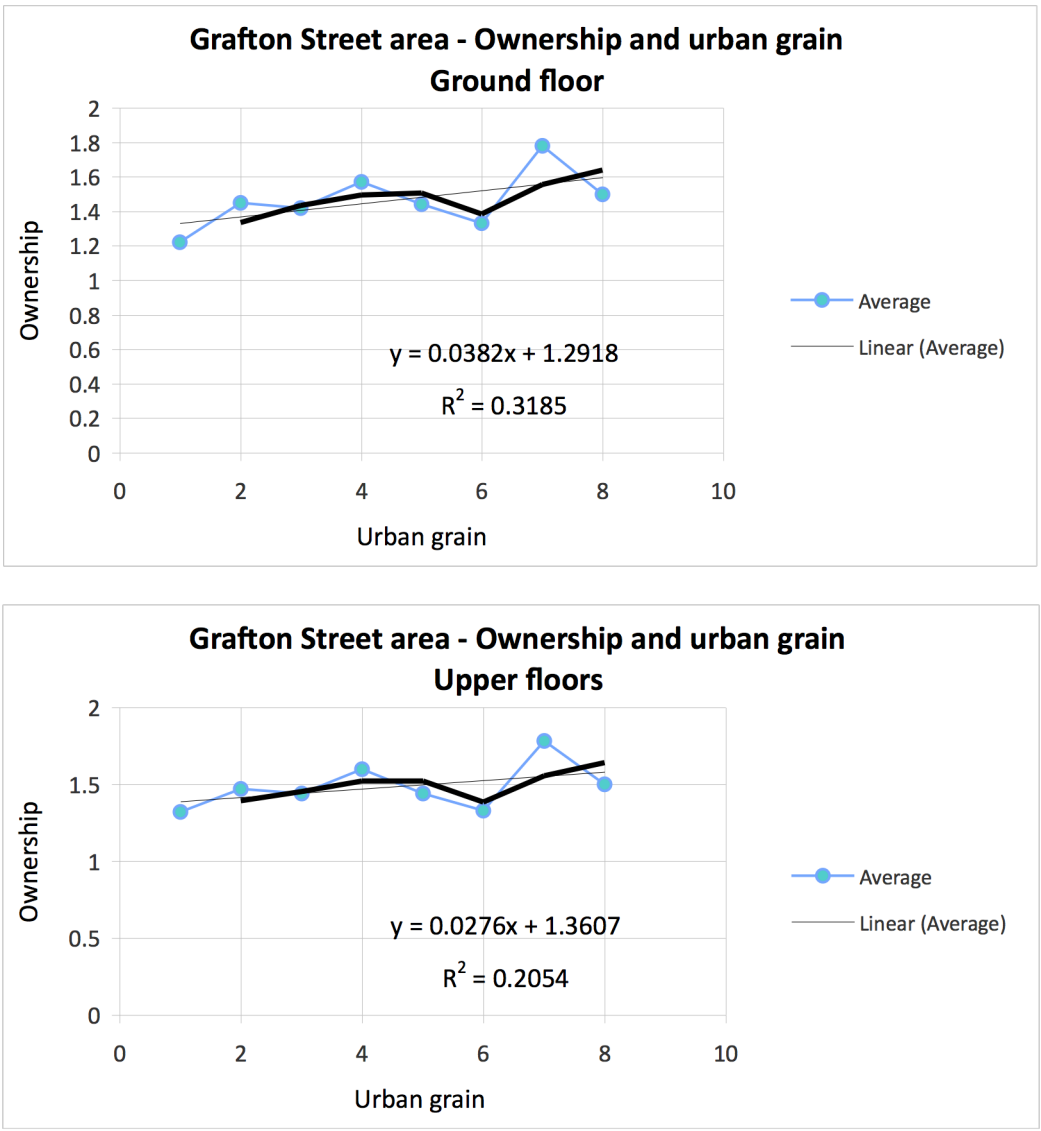
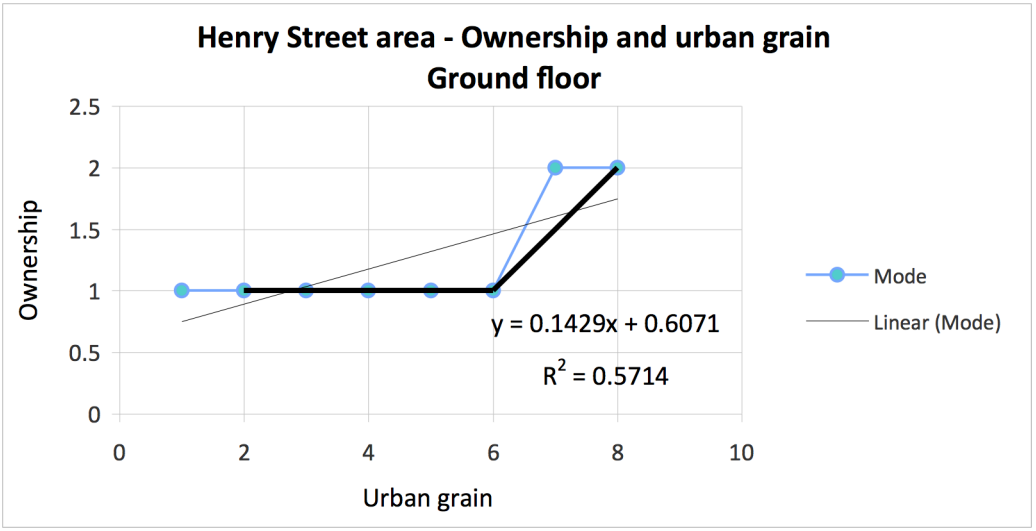


Figure 6.23. Linear and moving average trend analysis of the average number of uses for each grain type for the ground floor (top) and upper floors (below) in the Grafton Street area.

In looking at the Henry Street area the mode was multiple or chain (value of 1) for both ground floor and principal upper floor ownership. The average for ground floor ownership was 1.04 and 1.07 for principal upper floor ownership reflecting the very strong dominance of multiple or chain ownership in the area.

Figure 6.24 shows that ground floor and upper floors ownership trends for the mode follow almost the same positive pattern. When linear and moving average trends for the ground floor are fitted to the data series a positive relationship emerges, leading to the conclusion that a finer urban grain is indicative of higher levels of independent ownership. A similar trend is evident for ground floor and upper floor averages (Figure 6.25).



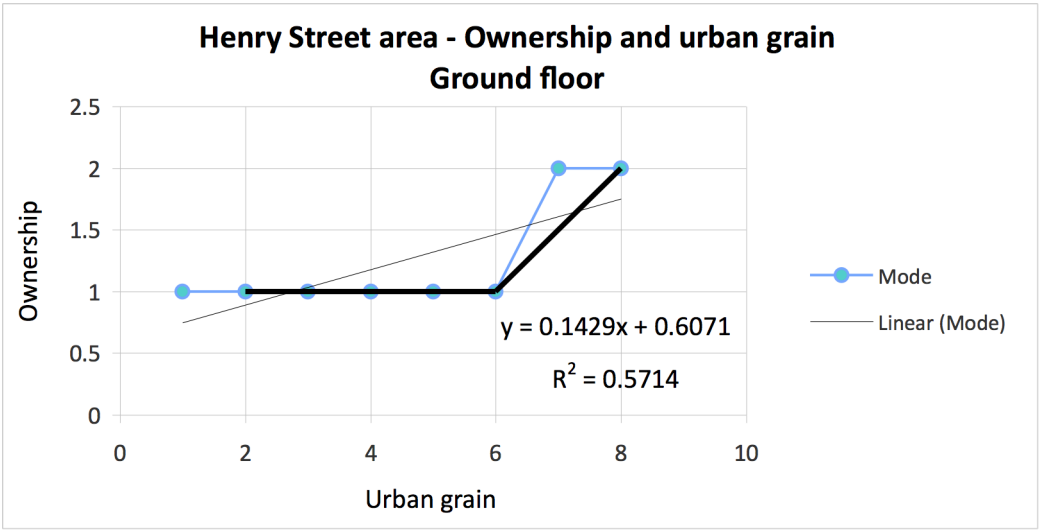


Figure 6.24. Linear and moving average trend analysis of the most common number of uses for each grain type for the ground floor (above) and upper floors (below) in the Henry Street area.

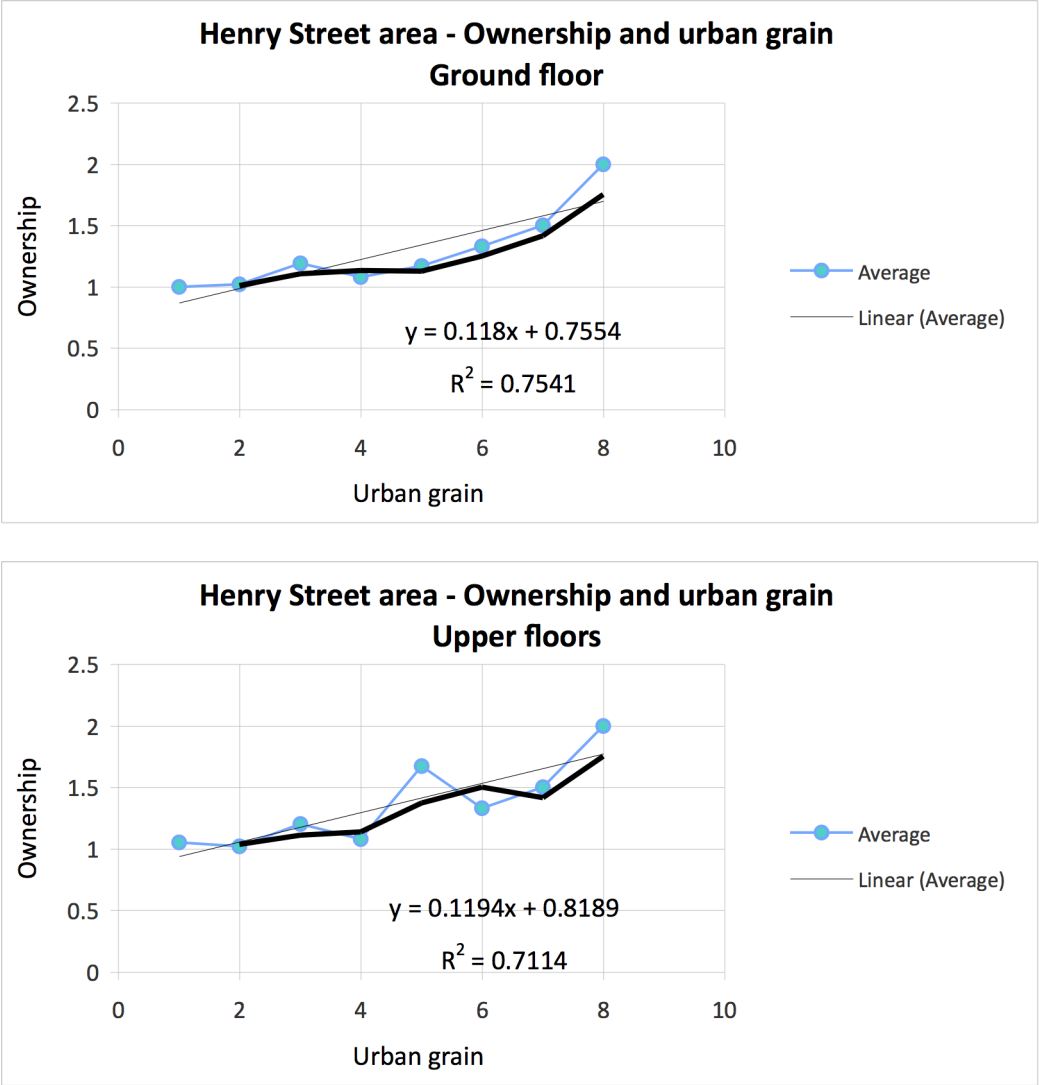


Figure 6.25. Linear and moving average trend analysis of the average number of uses for each grain type for the ground floor (top) and upper floors (below) in the Henry Street area.

In looking at the combined study areas the mode was multiple/chain (value of 1) for both ground floor and principal upper floor ownership. The average for ground floor ownership was 1.24 and 1.27 in the combined areas. Figure 6.26 shows that ground floor and upper floors ownership trends for the mode follow almost the same positive pattern. When linear and moving average trends for the ground floor are fitted to the data series a positive relationship emerges, leading to the conclusion that a finer grain is indicative of higher levels of independent ownership. A similar trend is evident for ground floor and upper floor averages (Figures 6.27).

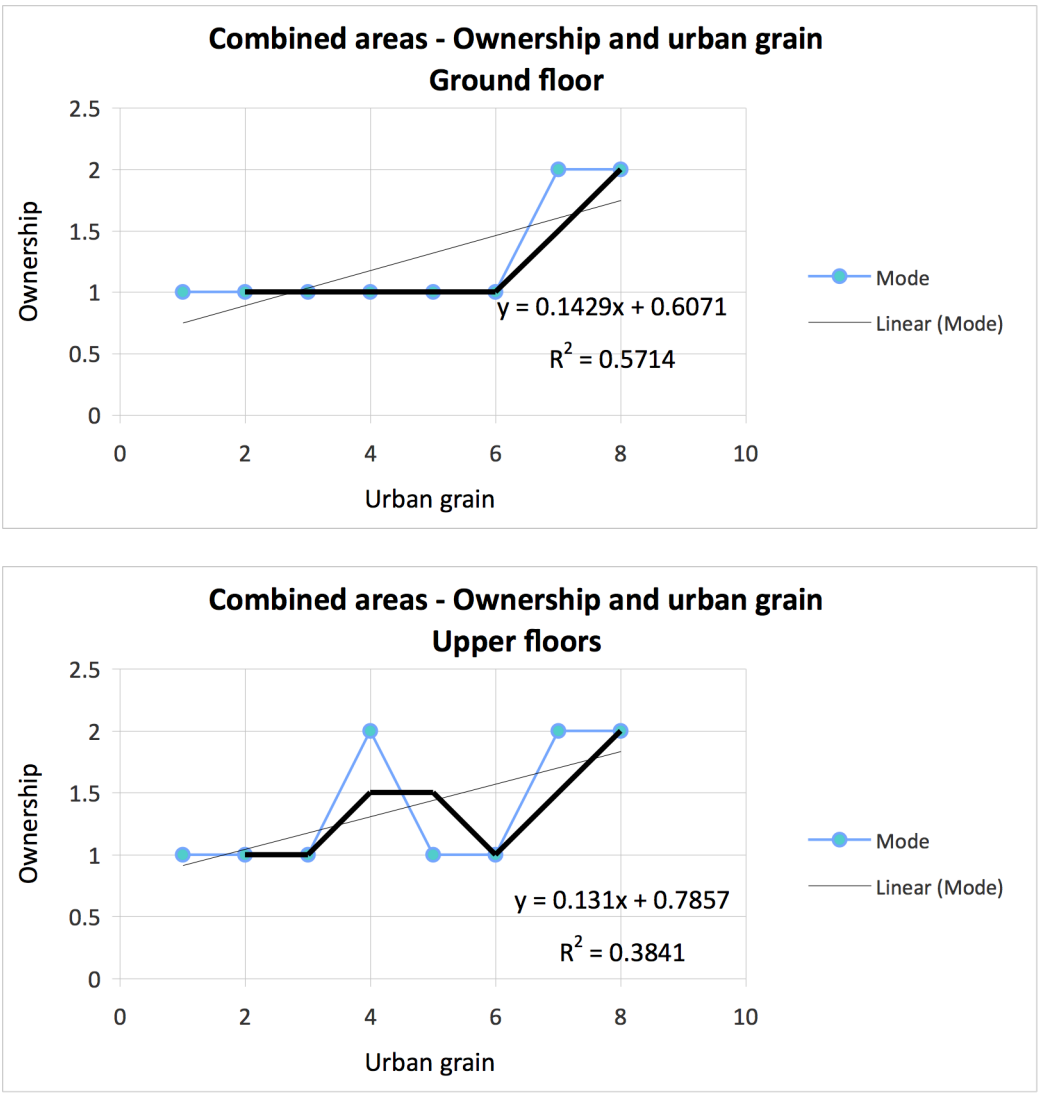


Figure 6.26. Linear and moving average trend analysis of the most common number of uses for each grain type for the ground floor (above) and upper floors (below) in the combined study areas.

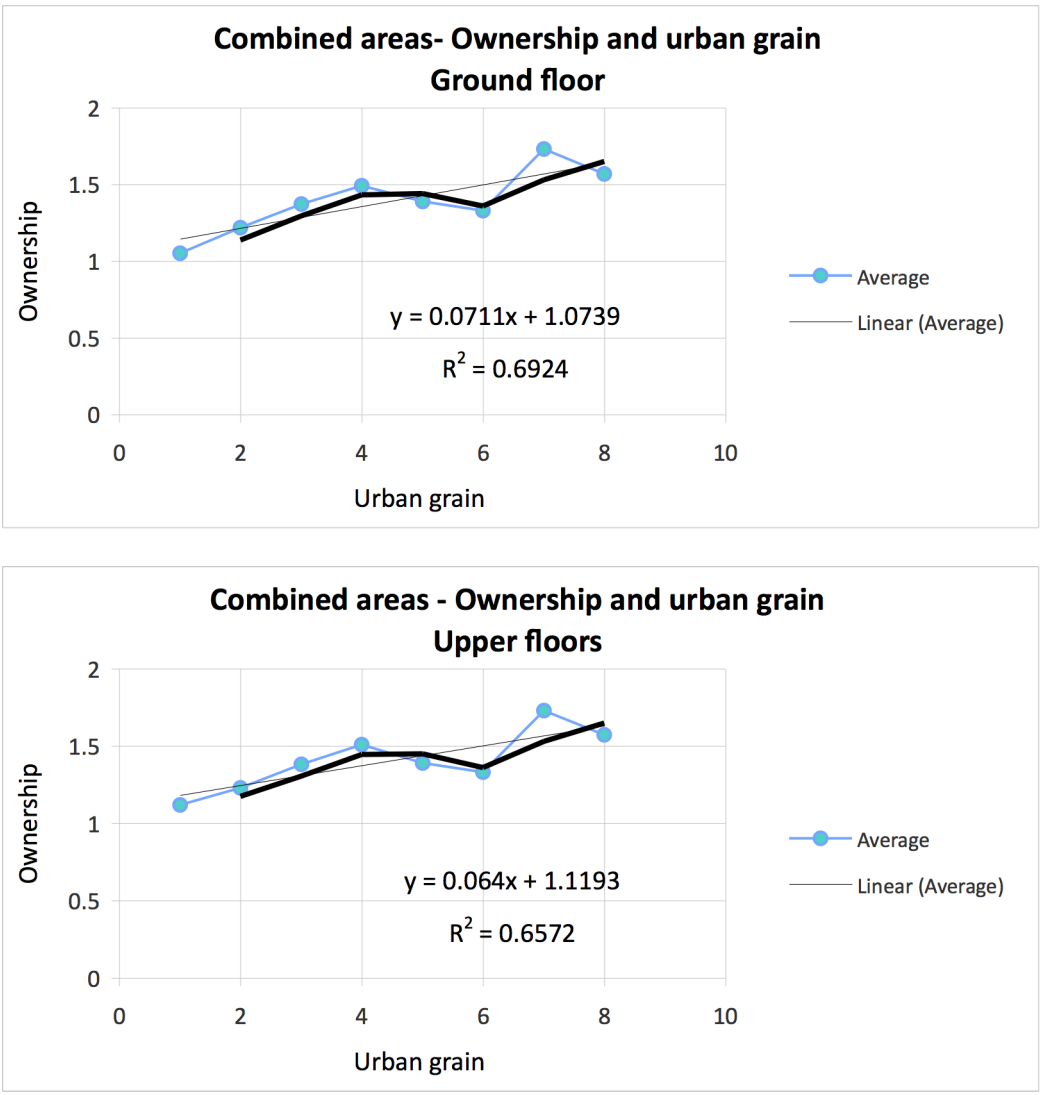


Figure 6.27. Linear and moving average trend analysis of the average number of uses for each grain type for the ground floor (top) and upper floors (below) in the combined study areas.

The descriptive statistics all show positive trends towards greater independent ownership with higher values for urban grain. Although the combined study area was strongly dominated by multiple/chain ownership, there is a distinctive trend towards greater private ownership, with higher values for urban grain. The relationship is similar but not as strong in the Grafton Street area and this is no doubt reflective of the distinctive ownership pattern already highlighted in the spatial analysis. The analysis also shows very little difference between ground floor ownership and principal upper floor ownership relationships with urban grain.

6.4.4 Summary of findings for ownership and urban grain

The principal findings are that:

- Ownership and urban grain were related on an area-wide basis, as the fine urban grain of Grafton Street had a much greater proportion of independent ownership than the Henry Street area;
- The correlations between urban grain and ownership were weak and negative for the individual case study areas and modest and negative for the combined study areas.
- The descriptive statistics provide a representative, area-wide analysis of the relationship between urban grain and mix of ownership. They consistently showed a positive relationship between finer urban grain and higher levels of independent ownership. They support the spatial analysis and, in particular, the well documented patterns of ownership on main shopping streets. They showed that there is very little difference in ownership by floor level in both study areas. They also showed that ownership is more strongly influenced by urban grain than floor level in the case study areas;
- Given the weakness of the correlations, and the positive relationships shown in the descriptive statistics, other variables, such as accessibility, footfall, and retailer preferences in shopping cores exert a significant influence on the ownership of businesses in the study areas (notably, the primary shopping streets);
- Urban grain appears to be a factor in ownership in the sense that large buildings and coarse urban grain are normally occupied by multiple or chain businesses and evidently unsuited to the needs of more modest-scaled independent businesses. This is particularly evident in the Henry Street area where only 4% of businesses were independently-owned at ground floor level;
- Secondary streets of fine urban grain in the Grafton Street area produced high levels of independent ownership and remnants of fine urban grain in the Henry Street area showed increased levels of independent ownership;
- Multiples and chains appeared to accept limitations of floorspace in the older building stock of the finer grain on the main shopping streets, although they rarely had another independent ownership overhead and often had unused or underused upper floors; and

- Many of the smaller units of the ILAC Mall in the Henry Street area, which are now considered too small for the needs of modern retailers in contemporary shopping centres, were occupied by small independent businesses.

It should be noted in generalising the findings that they may be affected by accuracy of ownership extents and the uniqueness of the ownership patterns in and around the main shopping cores.

6.4.5 Discussion on findings for ownership and urban grain

Although the findings return contrasting results for the correlation and the descriptive statistics, it is believed that this can be accounted for by the increasing dominance of multiples on main shopping streets. This pattern of ownership is highlighted in numerous sources, spanning academic and professional literature (Barton, Grant and Guise, 2010; NEF, 2010; Portas 2011). While the data are clear about the strength of the relationship between fine urban grain and independent ownership on the area-wide basis, the spatial analysis shows weak correlation over key areas. On further inspection of the raster mapping it is clear that a strong pattern of multiple ownership exists on primary shopping streets and within larger scale buildings. In other locations, including areas dominated by smaller buildings and secondary streets, ownership is predominantly independent. Given the nature of the study areas and their function as retail cores, this ownership profile and the spatial pattern it produces, skews the findings and creates this apparent contradiction in the findings. In considering the findings it is reasonable to generalise the area-wide findings, while including the caveat of the potential for skewed ownership on primary shopping or other specialist streets.

The findings support the claim made by McNeill (2011) that fine urban grain helps to diversify the urban economy by providing the smaller sized buildings and smaller scale work spaces, which are favoured by smaller independent businesses. The findings also provide evidence to support the claim as it was made on the basis of experiential knowledge and references to other studies, which also lacked robust evidence.

The empirical findings also support the rhetorical claim made by Jacobs (1993) who argued that fine urban grain provides more accessible and affordable spaces for locally-owned businesses and that the involvement of locally-owned businesses has the overall benefit of greater participation in the local economy and the added benefit of greater continuity of business in an area. He also argued that the involvement of local business in the local economy contributes to greater use mix.

Fine urban grain is also endorsed by current planning and urban design guidance for its role in securing mix of ownership. English Partnerships (2000) state that small plots and fine urban grain encourages secure diversity of tenures among other benefits. Again, this endorsement lacks any supporting evidence and the findings for this research now provide this.

The findings support the intriguing, but now dated, research by Robson and Pace (1983) which found a significant decline in independent ownership and a corresponding increase in multiple or chain ownership following the comprehensive redevelopment of traditional mixed use areas. Although this research did not explicitly relate to, or measure urban grain, it was concerned with the loss of traditional fabric, which often comprised fine urban, through amalgamation of small plots and redevelopment for retail and commercial purposes. The area-wide findings certainly reflect the evidence they provided in their research and it is notable that the ILAC centre, which shows low levels of mix of ownership and transformed larger areas of fine urban grain into coarse urban grain to facilitate the construction of a regional scale shopping centre, was completed at the time of their studies.

The empirical findings also support the claims, albeit rhetorical, around the role of fine urban grain in urban regeneration. Pitts (2004) argued that fine urban grain plays a key role in urban regeneration by providing a variety of ownerships and tenures. Montgomery (2003, p.296) makes a similar claim in the more specific context of culture-led regeneration of urban centres. His key indicators for successful urban regeneration include the tight urban grain and ' … patterns of mixed land ownership so that self-improvement and small-scale investment in property is possible … the proportions of locally owned or more generally independent businesses, particularly shops.' The findings are particularly relevant to the claims by Pitts (2004) and Montgomery (2003) as they both emphasise the importance of the area-wide, rather than the small plot or group of small plots analysis and approaches.

6.5 Mix of business and urban grain

Mix of business (distinct businesses as opposed to different business ownership types) has been another key claim for the benefits of fine urban grain. As discussed in Chapter 2, the claim has three, related aspects. This first aspect of the claim is that fine urban grain provides for a greater diversity of businesses (i.e. a greater density of individual businesses). This is prominent in the literature and policy for the urban centre, where a strong connection between business mix and diversity is made (Department for Business, Innovation and Skills, 2011). The second aspect of the claim is that fine urban grain is a necessary component or condition for the evening economy. The evening economy has been a feature of urban regeneration policy since the early 1990s (Office of the Deputy Prime Minister, 2004; Tallon, 2010) and is seen as necessary in broadening the role, image and appeal of urban centres in the face of challenging economic trends (Portas, 2011; Grimsey, 2013). The third aspect of the claim is that fine urban grain plays a role in developing better local business relationships. It is suggested that smaller independent businesses typical of fine urban grain have a greater need and desire than large businesses to build relationships with other small local businesses and take advantage of agglomeration and association (Cooper *et al., 2009*).

As with the claims for mix of uses and ownerships, this claim is essentially based on the suitability of the small workspaces of the small plots that form the basis of the fine urban grain, to small businesses and evening uses. However, as with the other claims, this claim was found to lack of underpinning evidence. It was considered therefore, a hypothetical relationship in the conceptual model (Chapter 4, Figure 4.1). As outlined in Chapter 5 (Section 5.2), a density-based approach was adopted for the business and evening uses aspects of the claim. The local business relationships aspect of the study was investigated using a survey of sampled businesses in both study areas.

6.5.1 Density of business

The analysis provides area-wide, gross and net business density figures for individual blocks (expressed on a hectare basis), allowing direct comparison with the urban grain data. A total of 549 businesses were recorded in both study areas on all floor levels, with total of 347 businesses in the Grafton Street area compared with 202 businesses in the Henry Street area. Their location is shown in Figure 6.28. It is clear from the mapping that there was a greater distribution and density of businesses in the Grafton Street area when compared with Henry Street area. It is notable that

the highest business densities were clustered around the fine urban grain of the Grafton Street area, where multiple businesses were accommodated over many floor levels. In contrast, the lowest densities in both areas are associated with blocks dominated by the department stores.

Figure 6.28. The location of distinct businesses in the Grafton Street area (above) and the Henry Street area (below). The dot is placed centrally in the plot and it represents the number of businesses per plot.

Table 6.9 provides the density figures for all blocks in both study areas. An analysis of the figures shows that the average business density per block was almost two and a half times greater in the Grafton Street area (71.7 business per hectare) than in the Henry Street area (33.3 business per hectare).

Grafton Street area	Business density Businesses/hectare	Henry Street area	Business density Businesses/hectare
Block A	61.6	**Block A**	21.3
Block B	50.0	**Block B**	47.1
Block C	99.0	**Block C**	31.5
Block D	22.6		
Block E	84.4		
Block F	55.4		
Block G	86.6		
Block H	137.0		
Block I	91.5		
Block J	76.7		
Block K	49.0		
Block L	66.2		
Block M	26.1		
Block N	119.8		
Block O	50.0		
Overall	**71.7**		**33.3**

Table 6.9. Business density measured by urban block in both study areas.

The figures also show little overlap in densities between both study areas. In almost all instances, business density was greater in the blocks in the Grafton Street area, which included two blocks with significantly more than 100 businesses per hectare. It is interesting to note that some blocks of coarser urban grain, comprising shopping malls, produced high business density (Blocks C and H). On closer analysis this relatively high business density resulted from their multi-level nature, where businesses were located on two or more levels. The lower values in the Grafton Street area (Blocks D and O) coincided with blocks dominated by non-commercial uses (e.g. School of Music and department stores). In contrast, the Henry Street area blocks produced significantly lower business densities than the Grafton Street area and the lowest value for the both study areas at 21 businesses per hectare (Block A). The block with the highest business density in the Henry Street area (Block B) was

notable as it included a department store and a shopping centre and would have been expected to return a low density. However, the higher business density figure appears to result from the combination of the small businesses in the remnant fine urban grain in the block and the multi-level nature of the shopping centre.

6.5.2 Density of business and urban grain

The analysis of correlation (Table 6.10) shows a strong relationship between the density of business and urban grain for the both study areas combined (when the data for both areas were considered together to form a larger dataset) with a positive value of 0.69. It also shows that the correlation for the Henry Street area was very strong with a positive value of 0.84 (although it should be emphasised that this is based a very small sample size, comprising only three blocks). The analysis also returned a strong correlation between urban grain and density of business in the Grafton Street area, with a positive value of 0.59.

Technique	Grafton Street area	Henry Street area	Combined case study areas
Pearson's correlation coefficient value	0.59	0.84	0.69
Strength of correlation	Strong	Very strong	Strong

Table 6.10 Correlation of urban grain and density of business.

The figures support the claim that fine urban grain hosts a greater density of businesses than coarse urban grain. Although there are no benchmarks for density of businesses per hectare in the urban centre, the basic figures for density of employment workplaces discussed in Chapter 5 (National Transport Authority, 2013) are an indicator of business activity. These data showed significantly higher densities of employment in the Grafton Street area than the Henry Street area.

While the study is limited in terms of its extent (22 hectares) and the floor area of businesses is not recorded, it is nonetheless a valuable contribution to this aspect of the claim. It is clear that there is a strong relationship between urban grain and business density. The analysis indicates that the smaller buildings and workspaces provided by fine urban grain are suitable to, and preferred by, smaller businesses. It also indicates that the larger floorplates of the coarse grain are not suitable to, or

preferred by, smaller businesses even though it is possible that these spaces could be internally subdivided, if the demand existed. Interestingly, the analysis shows that multi-level shopping centres (such as the Jervis Centre, the Powerscourt Townhouse) make a contribution to business density, despite their larger unit sizes. In contrast, it is clear that single level shopping centres and department stores (such the ILAC centre) produce low levels of business density.

6.5.2.1 Analysis of patterns and trends

To support the correlations a descriptive approach to the analysis of associations and segments of similar behaviour between business density and urban grain was carried out based on the block density data. A cluster analysis was provided and this was verified by fitting trend lines. Three significant outliers for business density were removed from the graphs to improve the fit of the trend lines.

In looking at the Grafton Street area, a clear and positive pattern is apparent (Figure 6.29). The trend lines are also positive, leading to the conclusion that increased density of plots (urban grain) results in greater business density.

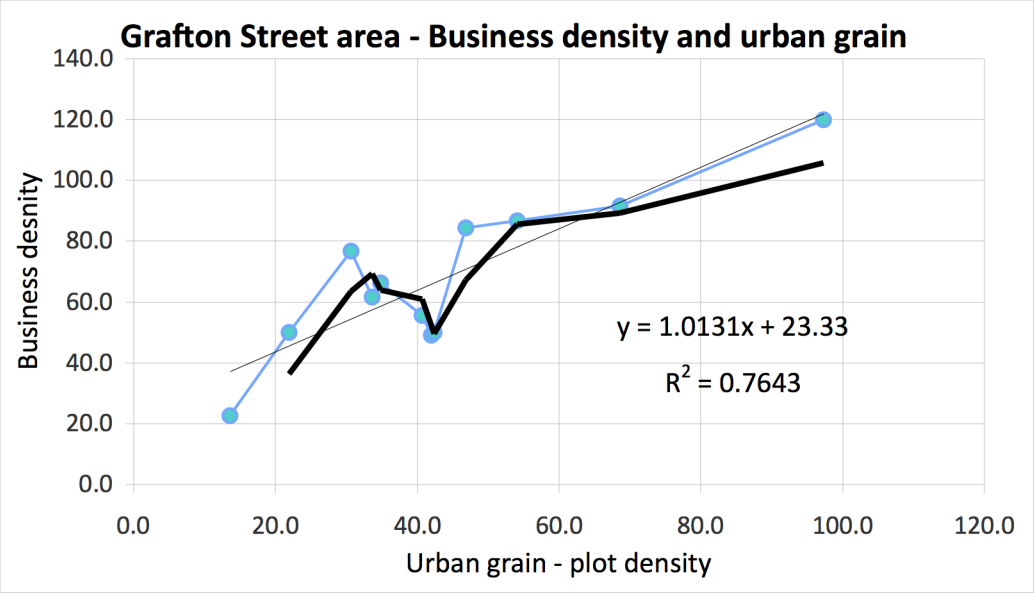


Figure 6.29. Linear and moving average trend analysis of business density and plot density in the Grafton Street area.

In looking at the Henry Street area (Figure 6.30), a clear pattern is apparent although there are only three values for each variable. In this case a linear trend only was fitted as there were too few values to calculate a moving average. The linear trend

line is positive, leading to the conclusion that increased density of plots (urban grain) results in greater business density. However, given the very small number of figures in this area, this analysis this should effectively be discounted.

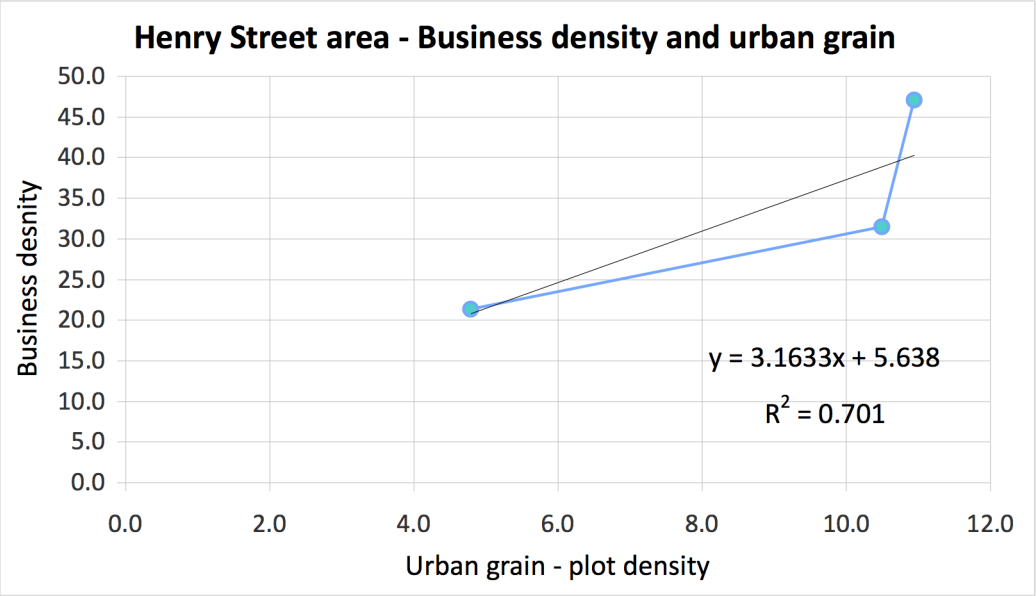


Figure 6.30. Linear trend analysis of business density and plot density in the Henry Street area.

In looking at the combined areas, it is also observed that the trend follows a pattern of a finer urban grain leading to greater density of businesses (Figure 6.31).

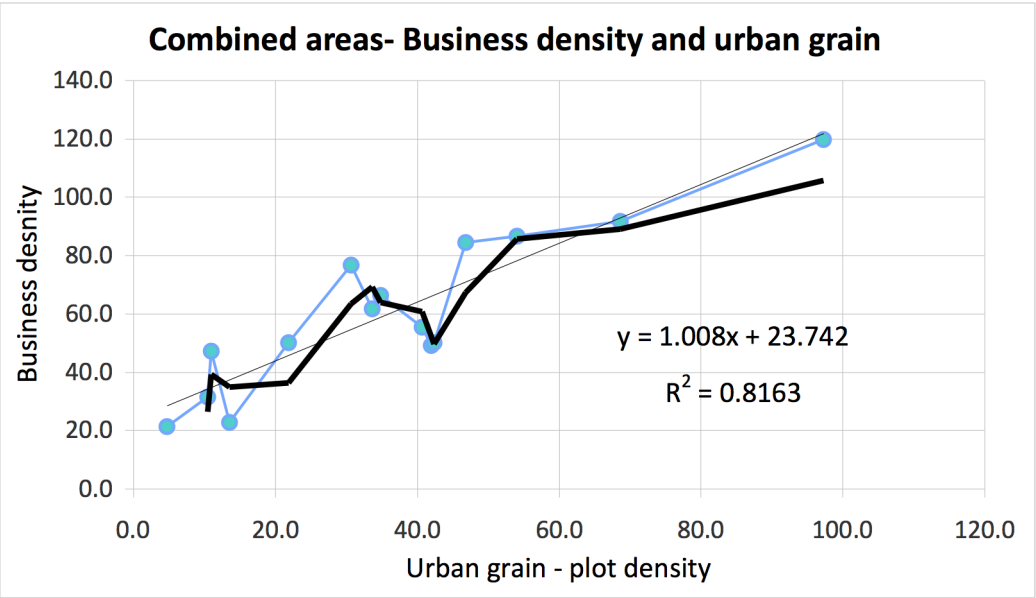


Figure 6.31. Linear and moving average trend analysis of business density and plot density in the Henry Street area.

The descriptive statistics for all areas show positive trends towards greater business density with higher values for urban grain. Although the Henry Street area shows a strong relationship between the variables, this must be tempered by the very small number of figures for the variables. The Grafton Street area and the combined study areas show very similar trend lines, again supporting the correlations.

6.5.3 Evening economy

The second aspect of the claim relates to the beneficial role of fine urban grain in the evening economy and, in particular, the hosting of evening uses (which remain open after 20.30hrs on most days). The analysis of the evening economy was carried out in the same manner as the business density analysis using the density-based approach and GIS. The analysis provides area-wide and block specific figures for both areas.

A total of 65 evening uses were recorded in both study areas on all floor levels. Of these, 63 were recorded in the Grafton Street area, compared with just 2 evening uses in the Henry Street area. The principal evening use was restaurant followed by public house/night club. Other evening uses included fast food restaurant, hotel, members club and theatre. The location of the evening uses is shown in Figure 6.32. It is clear from the mapping that there was a greater distribution and density of evening uses in the Grafton Street area when compared with Henry Street area. It was notable that evening uses were loosely clustering in and around the fine urban grain of the secondary streets of the Grafton Street area. It was also evident that there were very few evening uses on Grafton Street, the primary shopping street of the area. The mapping shows that the Henry Street area had a very low level of evening use with only two evening uses (café and restaurant) on Parnell Street. Interestingly, there were no evening uses within the shopping centres or department stores of both study areas. All evening uses had direct access and frontage to the street and most were located at ground floor level. It was also found that very few evening uses were located solely in upper floors.

Figure 6.32. Location of evening uses in the Grafton Street area (above) and the Henry Street area (below). Dots are placed centrally in the plot with blue representing an evening use. The red dot represents a non-evening use.

Table 6.11 provides the evening use density figures for all blocks in both study areas. An analysis of the figures shows that the average evening use density per block was more than seven times greater in the Grafton Street area (an average of 9.2 evening uses per hectare per block) than in the Henry Street area (and average of 1.3 evening uses per hectare per block).

Grafton Street area	Business density Businesses/hectare	Henry Street area	Business density Businesses/hectare
Block A	10.6	**Block A**	0.4
Block B	6.1	**Block B**	0.0
Block C	6.4	**Block C**	0.0
Block D	0.0		
Block E	10.9		
Block F	4.9		
Block G	5.4		
Block H	4.3		
Block I	18.3		
Block J	15.4		
Block K	7.0		
Block L	7.8		
Block M	26.1		
Block N	7.5		
Block O	7.6		
Overall	**9.2**		**1.3**

Table 6.11. Business density measured by urban block in both study areas.

The figures also show very little overlap in densities between both study areas. In almost all instances the density of evening uses was greater in the blocks in the Grafton Street area. A total of five blocks had densities of 10 or more evening uses per hectare. The highest density of evening uses was 26.1 per hectare (Block M). The figures show a strong variation in densities, which would appear to reflect the visible clustering of evening uses on the mapping. The presence of only two evening uses in the Henry Street is a striking contrast with the Grafton Street area. Notably, the lack of evening activity is reflected in the footfall figures for Henry Street, which

showed a major fall-off after normal retail hours, in contrast to Grafton Street, which maintained footfall into the evening period (Dublin BID, 2014).

6.5.4 Density of evening uses and urban grain

The analysis of correlation (Table 6.12) shows a moderate relationships between the evening use density and urban grain for both study areas combined (when the data for both areas were considered together to form a larger dataset) with a positive value of 0.43. It also shows that the correlation for Henry Street area was very strong and negative with a value of -0.99 (although this figure is not considered reliable due to the very small number of evening uses and blocks). The analysis also returned a modest correlation between evening use density in the Grafton Street area, with a positive value of 0.19.

Technique	Grafton Street area	Henry Street area	Combined case study areas
Pearson's correlation coefficient value	0.19	-0.99	0.43
Strength of correlation	Modest	Very strong	Moderate

Table 6.12. Correlation of urban grain and density of evening uses.

While the study is limited in terms of its extent (22 hectares) and the floor area and extent of evening uses is not recorded, it is nonetheless a valuable contribution to this aspect of the claim. The correlation figures provide only moderate support for the claim that fine urban grain is a necessary condition. It is clear that the finer urban grain Grafton Street area hosts a much greater level of evening uses than the coarser urban grain area of Henry Street. It is also clear when looking at the mapping that the evening uses are mostly located in small plots (around 85%), with a few (around 15%) such as hotels and clubs, located in large plots. This indicates a clear preference for smaller premises, which are typical of fine urban grain. Notwithstanding, the figures suggest that other factors may also be influencing evening economy in these case study areas. The displacement of evening uses from the primary shopping streets is particularly evident in the Grafton Streets area. This was not surprising given the apparent high level of competition for primary shopping street frontage, particularly from multiples and chains. There also appeared to be a clustering of similar uses on secondary streets, which indicated the benefits of

association for evening uses. This clustering was noticeably absent in the Henry Street area, where it might be speculated that opportunities for small evening uses and benefits of association are now severely limited.

6.5.4.1 Analysis of patterns and trends

To support the correlations a descriptive approach to the analysis of associations and segments of similar behaviour between evening use density and urban grain was carried out based on the block density data. A cluster analysis was provided and this was verified by fitting trend lines. Two significant outliers for evening use density were removed from the graphs to improve the fit of the trend lines.

In looking at the Grafton Street area, a clear pattern is present (Figure 6.33). The trend line is positive, leading to the conclusion that increased density of plots (urban grain) results in greater levels of evening use density.

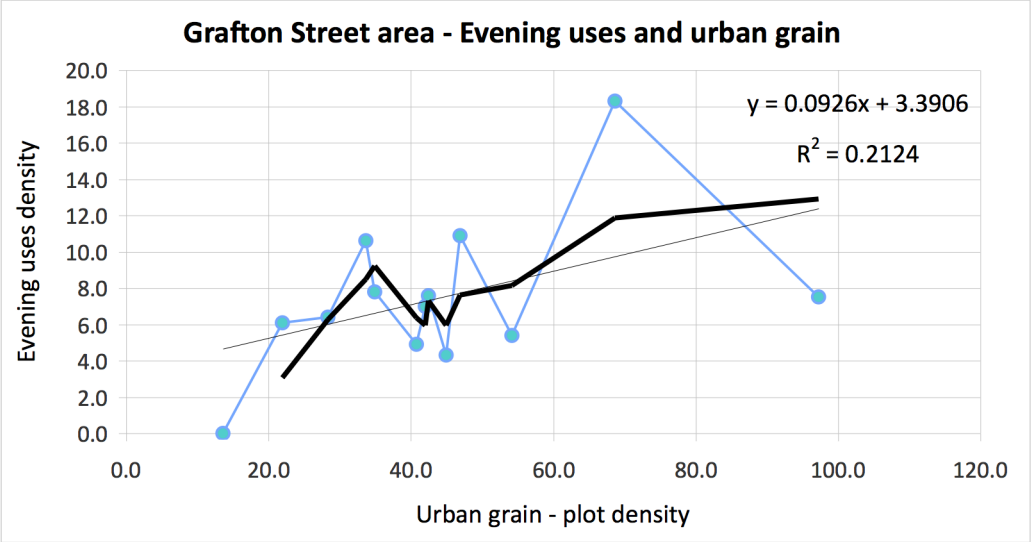


Figure 6.33. Linear and moving average trend analysis of evening use density and plot density in the Grafton Street area.

In looking at the Henry Street area, the trend line is negative (Figure 6.34), indicating that increased density of plots (urban grain) results in lower levels of evening use density. In this case a linear trend only was fitted as there were only two figures available. Given this, the analysis should be disregarded.

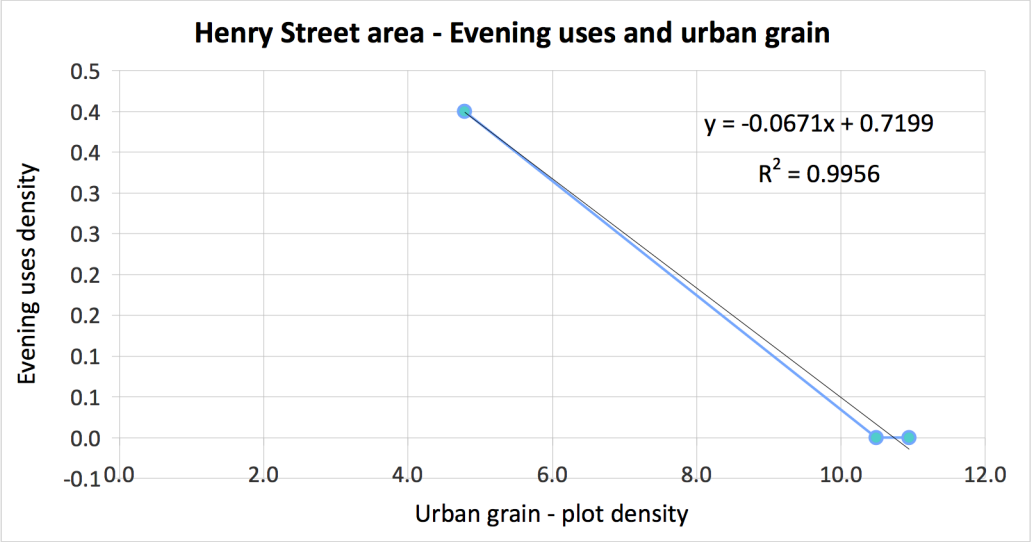


Figure 6.34. Linear trend analysis of evening use density and plot density in the Henry Street area.

In looking at the combined areas (Figure 6.35) it is also observed that the trend follows a pattern of a finer urban grain leading to a greater levels of evening use density.

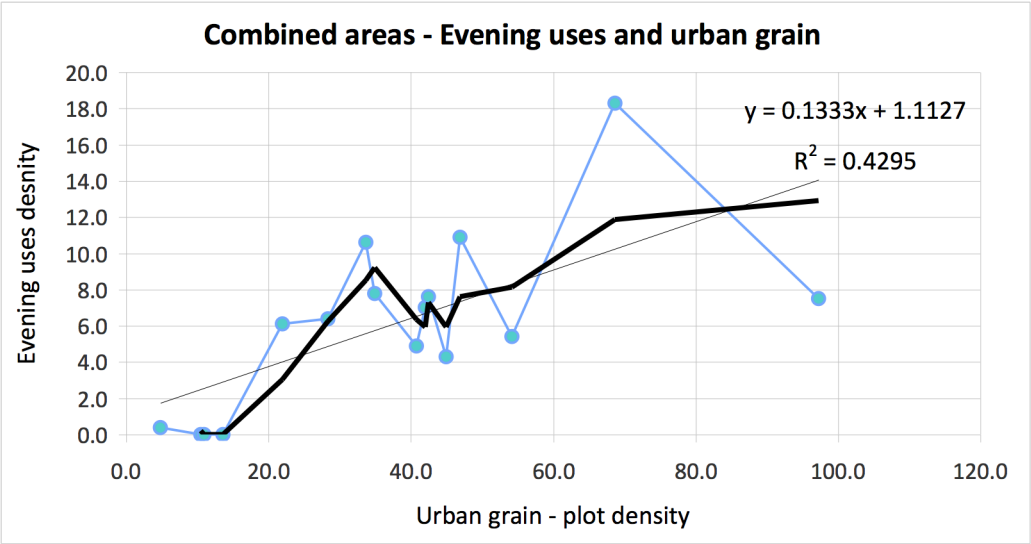


Figure 6.35. Linear and moving average trend analysis of evening use density and plot density in the Henry Street area.

The descriptive statistics all show positive trends towards greater evening use density with higher values for urban grain. Although the Henry Street area shows a strongly negative relationship between the variables, this must be disregarded due to the very small number of figures in the variables. The Grafton Street area and the combined study areas show very similar positive trend lines, again supporting the correlations.

6.5.5 Business relationships

The survey of local businesses provided a better understanding of local business relationships and allowed the final aspect of the claim to be tested. This claim centres on the beneficial role that fine urban grain plays in fostering and hosting better local business relationships such as spillovers, business clusters, spin-offs and local services (Montgomery, 2003). The survey was a non-probabilistic, strata sample and it was sent by email to 380 businesses (There were approximately 549 businesses in both study areas). Initially, a low response rate was achieved, so the survey was continued on a door-to-door basis. In total, 59 responses were considered to be fully completed from both study areas (Figure 6.36). The questionnaire included questions about the regularity and nature of interaction with other local businesses, membership and engagement with a local representative group and years in operation.

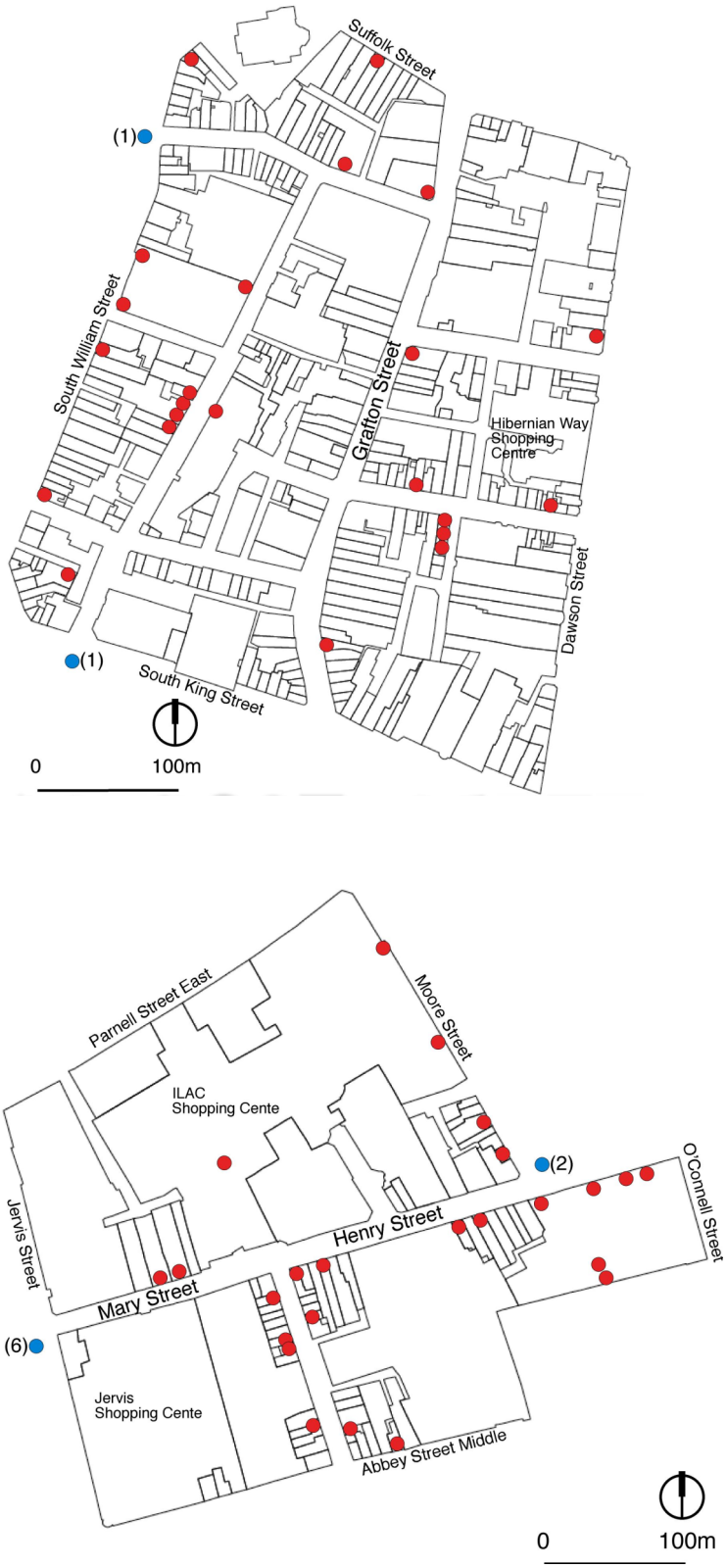


Table 6.36. Location of interview respondents (red dots) in the Grafton Street area (above) and the Henry Street area (below). Blue dots are responses on the boundary of the study areas.

6.5.5.1 Regularity of interaction with local businesses

The question around the nature of relationships between local businesses sought responses that could point to any difference between the nature of relationships between smaller businesses in fine urban grain and larger businesses in coarse urban grain. The question was:

> 'Do you interact regularly, for business or other purposes, with any other business on your street? If you do, could you please list them and the nature of your interaction.'

A total of 57 responses were received to this question. The sample shows, surprisingly, that only 38% of all businesses in the study areas have regular interaction for business or other purposes with any other business on their street.

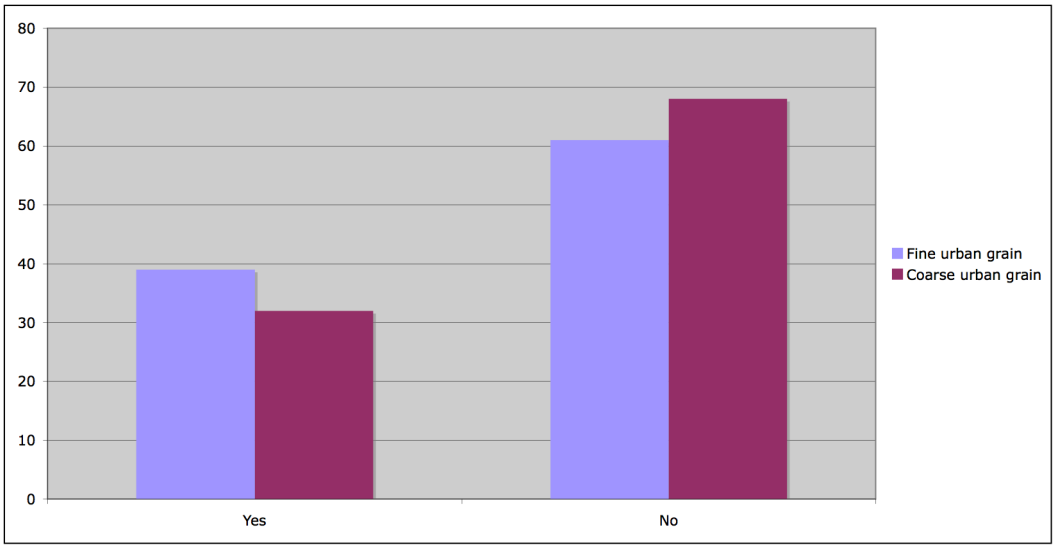


Figure 6.37. Business interaction and urban grain.

Significantly, for this research the sample did show that a marginally greater number of businesses in fine urban grain (39%) had regular interaction with other businesses on their street than businesses in the coarse urban grain (33%).

Of the small number of respondents who included further details of their interactions with other businesses (a total of 20) the majority was from the businesses in the fine urban grain. These responses illuminate the nature of associations between businesses and include:

- Recommendations to customers for other shops of a similar nature in the area, such as womenswear, jewelers, hardware, and restaurants;
- Recommendations to customers for other services, for example, recommendations from restaurants for local entertainment such as the theatre, or from clothing retailers for local, clothes alterations services; and
- Offers of business deals to other local businesses, for example deals on bicycles for the staff of other local businesses.

The responses also showed that the local business relationships developed by smaller businesses in fine urban grain were mostly with other smaller businesses in the fine urban grain. This indicated that local businesses understood the benefits of association with competitor businesses. In contrast to the smaller businesses, larger businesses mentioned more general issues such as local or area branding initiatives, dealing with the homeless, lobbying for street improvements, dealing with street protests and dealing with the local authority and business associations on street closures.

6.5.5.2 Business membership

The question around levels of involvement of businesses in the local economy sought to establish any difference between involvement with local business groups or associations and the urban grain in the study areas. The question was:

'Are you an active member of any local business group or association?'

A total of 57 responses were received to this question (See Figure 6.38). The majority of businesses (59%) were active members of a local business group or association. Of these, approximately 75% were active with Dublin Business improvement District (It should be noted that all businesses in the area are members of the Dublin BID, although not all are active in this organisation). The Dublin City Business Association is a long-established business representative group that was also well represented in the responses. Other groups mentioned were the Restaurant Association of Ireland, Street Traders Associations and Tenants Associations in shopping centres.

The survey showed a difference between the levels of involvement in local business groups and associations in the fine urban grain and the coarse urban grain, with levels of involvement in local business groups and associations in the fine urban grain (62%) being marginally higher than in the coarse urban grain (57%).

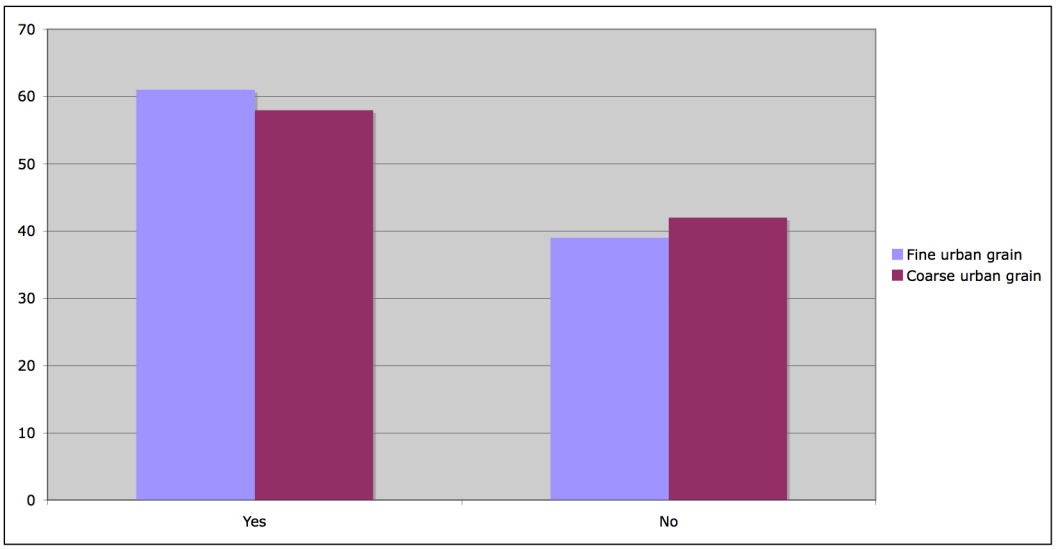


Table 6.38. Comparison of membership and association by urban grain (percentages).

6.5.5.3 Years in operation

The question around the length of time in operation of a business sought to identify any differences in these relationships in the urban grain in the study areas. The question was:

> 'How long have you been operating in this premises?

A total of 56 valid responses to this question were received. The response options were provided as time periods and coded 1 to 5, ranging from less than one year in operation to over 20 years in operation. In seeking to establish any differences in these relationships in the urban grain in the study areas, responses for fine urban grain businesses and coarse urban grain businesses were separated. The survey found that the mean period in operation was between 11 and 20 years for coarse urban grain and between 6 and 10 years for fine urban grain. The survey also showed that most businesses in fine urban grain were either in operation between 2 and 5 years or for more than 20 years, with low numbers in operation for between 11 and 20 years. In contrast, most businesses in coarse urban grain were in operation for either 2 to 5 years or 6 to 10 years. Although the numbers in each category are relatively small,

they do indicate that while fine urban grain is attractive for new businesses, a high proportion of the businesses were in operation for more than 20 years.

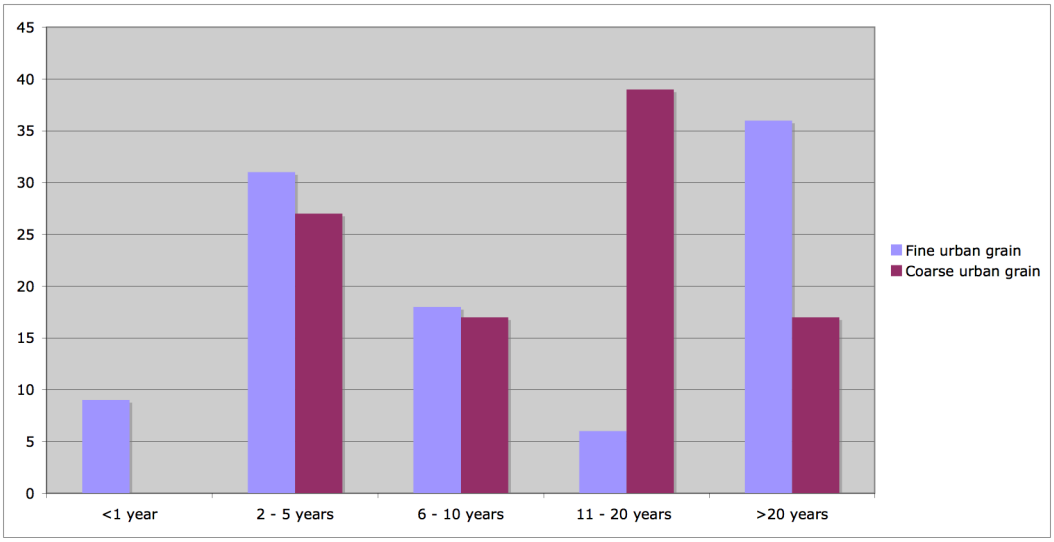


Table 6.39. Comparison of length of time in operation by urban grain (percentages).

Other patterns around length of time in business and business relations were not found to be distinctive, although it was noted that businesses in operation for over 20 years had notably higher than average levels of active involvement (71%) in local business groups and associations and that businesses in operation for between 6 and 10 years had notably higher than average levels of regular interaction (50%) with other local businesses.

6.5.6 Summary of findings for mix of business and urban grain

Urban grain plays a key role in business density. The correlations and the descriptive statistics reveal a positive relationship that supports the claim that a finer urban grain provides a greater density of businesses. In particular, the findings for density of business show that:

- Areas and urban blocks of fine urban grain produced substantially greater business density than areas and blocks of coarse urban grain;
- The smaller buildings and workspaces provided by fine urban grain were preferred by smaller businesses and the larger floorplates of the coarse grain were not normally subdivided and occupied by smaller businesses; and
- Multi-level shopping centres make a contribution to business density, despite their larger unit sizes. In contrast, single level shopping centres and department stores (such the ILAC centre) produce low levels of business density.

Urban grain plays a key role in the evening economy. The correlations and descriptive statistics show positive relationships, of different strengths, between urban grain and density of evening uses. In particular, the findings for density of evening uses show that:

- Fine urban grain hosted substantially greater densities of evening uses than the coarse urban grain and it could be seen from the mapping that around 85% of evening uses were located in small plots;
- The density of evening uses in coarse urban grain area is extremely low, so low as to render statistical analysis of the figures meaningless;
- Evening uses were all observed to be located where they had independent and direct access to the public street. This highlights the difficulties in stimulating evening uses in shopping centres, malls, arcades and multi-unit complexes;
- Evening uses were mainly located in fine urban grain on secondary streets and there was evidence of clustering from the mapping;
- Evening uses appeared to be displaced from primary shopping streets by multiple retailers (this was also noted in the survey of ownership); and
- It could be speculated that clustering of evening uses was not possible in the remaining small areas of fine urban grain in the coarse grain area, as a critical mass no longer existed to support an adequate number of evening uses to generate benefits of association.

Urban grain plays a modest role in local business relationships. The responses to the social survey of sampled businesses showed small but noticeable differences between businesses in fine and coarse urban grain. In particular, the findings for businesses show that:

- Surprisingly low numbers of businesses in the study area had regular contacts with other local businesses, although marginally more small businesses in fine urban grain (39%) had regular contacts with other local businesses when compared with businesses in coarse urban grain (33%);
- Local business relationships were generally maintained between small businesses, which were of a similar nature, provided related services (such as alterations for clothing retail) or provided deals for the staff (such as discounts for bicycles);

- The majority of all businesses (59%) were active members of a local association and it also found that marginally more businesses in fine urban grain (62%) were active members of local associations than businesses in coarse urban grain (57%); and
- Businesses in fine urban grain were generally younger (mean of between 6 and 10 years in operation), when compared with the coarse urban grain (mean of between 11 and 20 years in operation). However, the majority of businesses were either new, or recently set-up, or in operation for many years. This indicates that fine urban grain is both attractive to new businesses and suitable for the longer-term viability of small business.

6.5.7 Discussion on findings for mix of business and urban grain

The findings strongly support the research of Robson and Pace (1983), which, alongside decline in mix of ownership, also found much lower levels of business diversity, such as speciality shops and employment in comprehensively redeveloped areas, despite increased overall floorspace and unit sizes. Notably, they concluded that the branches of national multiples had only a marginal concern with local networks and linkages. Although their work is now over 30 years old, there is relevance to the case study areas given the fact that the ILAC centre and the Hibernian Way centre are of similar typology and the result of comprehensive redevelopment of plots and blocks in the 1980s.

The lower density of businesses observed in the Henry Street area is reflected in other figures presented in this research. Firstly, increased levels of vacancy observed in the land use profile for the area (27% as opposed 13% in the Grafton Street area) (Table 6.3) reflect lower business density in the Henry Street area than the Grafton Street area. Secondly, the lower footfall observed in the Henry Street area (Dublin BID, 2014) is likely to result, at least in part, from its poorer mix of business (Department for Business, Enterprise and Skills, 2011) (as measured by business density) when compared with the Grafton Street area.

The findings concur with the wide-ranging claims made by Montgomery (2003) for fine urban grain and its benefits for culture-led regeneration. In achieving a strong, local small–firm economy Montgomery (2003) highlights the importance of the fine grain urban morphology, a variety and adaptability of building stock and active frontages (p.299) which is notably secured in a dense ‘ … town or cityscape, and

particularly those with a tight rather than a loose urban grain.' The findings also support Pitts' (2004) contention that fine urban grain and the smaller buildings it comprises are an essential aspect of the urban form, which can foster the sort of uses needed for a more diverse local economy to achieve urban regeneration.

The findings support Montgomery's (2003, p.297) assertion that 'Successful cultural quarters will almost certainly have a strong evening economy.' He includes variety and patterns of opening hours and the existence of evening and night-time activity as key indicators and he stresses the important role of fine-grain urban morphology, a variety and adaptability of building stock and active frontages as part of the built form in securing the evening economy.

The findings support McNeill (2011) in his claims that fine urban grain can make a strong contribution to revitalisation of the urban centre. In particular, it supports the contention that the wider range of potential uses and owners that fine urban grain offers gives rise to opportunities to extend business activity into the night-time and weekends in urban centres. The findings provide an empirical basis to his rhetorical claims. The findings also support the arguments made by Six Degrees (2008) in their strategy for revitalising the fine grain of Sydney City Centre. They highlighted the role of fine urban grain in secondary streets and lanes in encouraging evening businesses such as small bars and restaurants to locate, and to thrive, in the city centre. The strategy was based on normative arguments and experiential knowledge.

Although the findings showed that fine urban grain performs only marginally better than coarse urban grain in terms of local business relationships and associations, they do, nonetheless, support the claims made by Montgomery (2003) that connect fine urban grain and stronger relationships with other local businesses. These include the complex inter-trading of small businesses in fine urban grain, which results in business spillovers, business clusters and spin-offs.

The existence of business spillovers, such as recommendations to customers for other similar and businesses and services, is supported by the findings. Businesses in fine urban grain are shown to be better in terms of engagement with other local businesses. The findings also support the claim for business clusters arising from the attraction for consumers of choice of nearby competitor businesses. The greater level of engagement of businesses in fine urban grain is supported by the business density

and evening use density findings, which showed evidence of clusters on the secondary streets of the fine grain, Grafton Street area.

The findings around years of operation appear to support the claims made by a number of authors connecting fine urban grain and the opportunities for new small businesses and start-ups (Montgomery, 2003; Six Degrees, 2008; McNeill, 2011). The findings show that businesses in the fine urban grain were, on average, younger than the coarse urban grain. However, they also show that a high proportion were in operation for over 20 years. This also supports Jacobs' (1993) contention that fine grain gives rise to greater business continuity by virtue of the more local and independent nature of businesses he claimed it attracted.

6.6 Summary

This chapter set out the analysis and findings of the research. Specifically, it presented the findings around the relationships between the independent variable (urban grain) and the dependent variables (mix of uses, mix of ownership and mix of business). This chapter also included discussion around the findings and their relevance to the claims in the literature. Summaries of the findings follow the discussion on each claim. The findings and discussions will be interpreted and placed within their larger theoretical and practice context in the conclusions of this research.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

This chapter presents the conclusions and recommendations of the research. It provides a brief recap of the research aim and objectives and it structures the conclusions and recommendations of this research around these. The theoretical implications for the research are considered in two sections. The first section deals with the implications of the research for the theory around terms, concepts and the urban context of urban grain. The second section deals with the implications of the research for the theory around the claims for fine urban grain and diversity of the urban centre. The chapter then sets out the main implications of the research for policy and practice. The limitations of the research are then identified and this is followed by recommendations for further research in this area. The chapter concludes with a consideration of the success of the research in achieving its aim and objectives.

7.2 Research aim and objectives

The aim and objectives of the research provide a good framework for the conclusions and evaluation of the success of the research. To recap, the aim of this research is to determine the effects of urban grain on the diversity of the urban centre. In order to achieve this aim, the research was structured around five research objectives. These were:

i. To establish a clear understanding of the terms, concepts and claims around urban grain in the urban centre;
ii. To establish the relevant theoretical, urban and planning policy context for the urban centre;
iii. To develop and implement a research methodology for investigating key claims around mix of use, ownership and business for fine urban grain in the urban centre;
iv. To critically analyse and interpret the findings of the research and their implications for the current theory; and
v. To provide policy and practice recommendations for urban grain in the urban centre.

7.3 Summary of the findings

The main findings of the research can be summarised under the principal claims under investigation. These are findings for urban grain and mix of uses, findings for urban grain and mix of ownership and findings for urban grain and mix of business.

7.3.1 Urban grain and mix of uses

The principal findings for urban grain and mix of uses were that:

- The model developed for measuring the intensity of land use mix on a grid basis was appropriate, robust and compatible with similar models for measuring land use mix and urban grain;
- On a case study area basis, there was a demonstrable relationship between the fineness of urban grain and greater levels of land use mix. The case study area with finer urban grain (Grafton Street area) had a greater mix of uses than the coarse urban grain study area (Henry Street area), when considering land use profiles and mean values for LUM and MUI;
- There was a strong correlation between the intensity of urban grain and mix of uses in the Grafton Street area and for both study areas combined and a moderate relationship in the Henry Street area; and
- The supporting descriptive statistical analysis showed a strong relationship between land use mix and urban grain in the Grafton Street area, the Henry Street area and the combined study areas.

7.3.2 Urban grain and mix of ownership

The principal findings for urban grain and mix of ownership were that:

- Ownership and urban grain were related on an area-wide basis, as the fine urban grain of Grafton Street had a much greater proportion of independent ownership than the Henry Street area;
- The correlations between urban grain and ownership were weak and negative for the individual case study areas and modest and negative for the combined study areas;
- The descriptive statistics provide a representative, area-wide analysis of the relationship between urban grain and mix of ownership. They consistently showed a positive relationship between finer urban grain and higher levels of independent ownership. They support the spatial analysis and, in particular, the well documented patterns of ownership on main shopping streets. They showed that there is very little difference in ownership by floor level in both

study areas. They also showed that ownership is more strongly influenced by urban grain than floor level in the case study areas;

- Given the weakness of the correlations, and the positive relationships shown in the descriptive statistics, other variables, such as accessibility, footfall, and retailer preferences in shopping cores exert a significant influence on the ownership of businesses in the study areas (notably, the primary shopping streets);
- Urban grain appears to be a factor in ownership in the sense that large buildings and coarse urban grain are normally occupied by multiple or chain businesses and evidently unsuited to the needs of more modest-scaled independent businesses. This is particularly evident in the Henry Street area where only 4% of businesses were independently-owned at ground floor level;
- Secondary streets of fine urban grain in the Grafton Street area produced high levels of independent ownership and remnants of fine urban grain in the Henry Street area showed increased levels of independent ownership;
- Multiples and chains appeared to accept limitations of floorspace in the older building stock of the finer grain on the main shopping streets, although they rarely had another independent ownership overhead and often had unused or underused upper floors; and
- Many of the smaller units of the ILAC Mall in the Henry Street area, which are now considered too small for the needs of modern retailers in contemporary shopping centres, were occupied by small independent businesses.

7.3.3 Urban grain and mix of business

The findings for urban grain and density of business element of the claim show that:

- Areas and urban blocks of fine urban grain produced substantially greater business density than areas and blocks of coarse urban grain;
- The smaller buildings and workspaces provided by fine urban grain were preferred by smaller businesses and the larger floorplates of the coarse grain were not normally subdivided and occupied by smaller businesses; and
- Multi-level shopping centres make a contribution to business density, despite their larger unit sizes. In contrast, single level shopping centres and department stores (such the ILAC centre) produce low levels of business density.

The specific findings for urban grain and density of evening uses element of the claim show that:

- Fine urban grain hosted substantially greater densities of evening uses than the coarse urban grain and it could be seen from the mapping that around 85% of evening uses were located in small plots;
- The density of evening uses in coarse urban grain area is extremely low, in fact, so low as to render statistical analysis of the figures meaningless;
- Evening uses were all observed to be located where they had independent and direct access to the public street. This highlights the difficulties in stimulating evening uses in shopping centres, malls, arcades and multi-unit complexes;
- Evening uses were mainly located in fine urban grain on secondary streets and there was evidence of clustering from the mapping;
- Evening uses appeared to be displaced from primary shopping streets by multiple retailers (this was also noted in the survey of ownership); and
- It could be speculated that clustering of evening uses was not possible in the remaining small areas of fine urban grain in the coarse grain area, as a critical mass no longer existed to support an adequate number of evening uses to generate benefits of association.

Urban grain plays a modest role in local business relationships. The responses to the social survey of sampled businesses showed small but noticeable differences between businesses in fine and coarse urban grain. In particular, the findings for businesses show that:

- Surprisingly low numbers of businesses in the study area had regular contacts with other local businesses, although marginally more small businesses in fine urban grain (39%) had regular contacts with other local businesses when compared with small businesses in coarse urban grain (33%);
- Local business relationships were generally maintained between small businesses, which were of a similar nature, provided related services (such as alterations for clothing retail) or provided deals for the staff (such as discounts for bicycles);
- The majority of all businesses (59%) were active members of a local association and that marginally more businesses in fine urban grain (62%)

were active members of local associations than businesses in coarse urban grain (57%); and

- Businesses in fine urban grain were generally younger (mean of between 6 and 10 years in operation), when compared with the coarse urban grain (mean of between 11 and 20 years in operation). However, the majority of businesses were either new, or recently set-up, or in operation for many years. This indicates that fine urban grain is both attractive to new businesses and suitable for the longer-term viability of small business.

7.3.4 The findings and the conceptual model

As discussed above, the findings by and large provided strong or moderate positive results for the hypohesised relationships identified in the conceptual model (Figure 7.1). In regard to mix of uses, on the basis of the findings, it can be stated that the hypothetical relationship outlined in the conceptual model is strong in nature. Accordingly, the hypothesis outlined in the conceptual model, 'That fine urban grain leads to greater mix of uses than coarse urban grain' is accepted. In regard to mix of ownership, on the basis of the findings, it can be stated that the hypothetical relationship outlined in the conceptual model is moderate in nature with some conflicting results and unique context issues. Accordingly, the hypothesis outlined in the conceptual model, 'That fine urban grain leads to greater mix of ownership than coarse urban grain' is accepted with some important provisos. In regard to mix of ownership, on the basis of the findings, it can be stated that the hypothetical relationship outlined in the conceptual model is strong in most respects. Accordingly, the hypothesis outlined in the conceptual model, 'That fine urban grain leads to greater mix of business than coarse urban grain' is accepted.

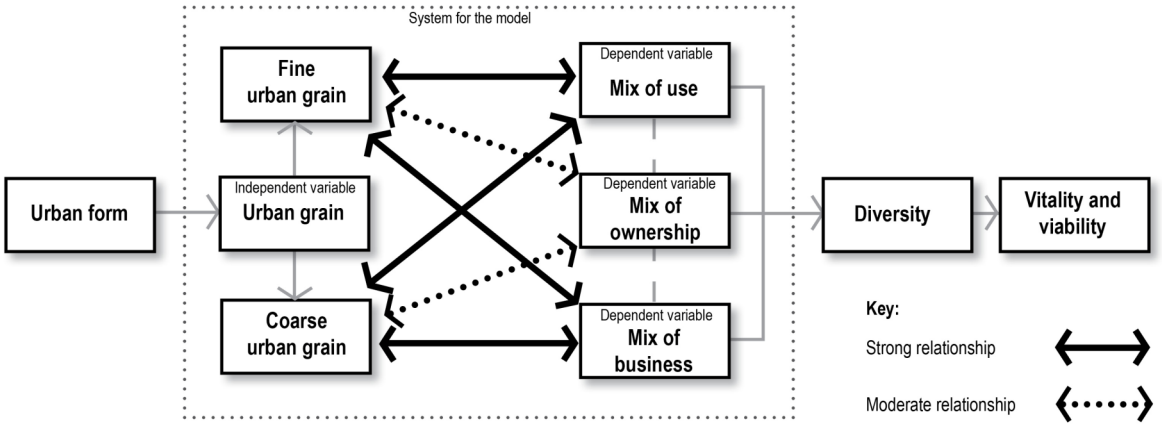


Figure 7.1 The strength of the relationships in the conceptual model.

7.4 Implications of the findings for theory

The first set of conclusions focuses on the more general findings of the research, which were around the terms, concepts and claims for fine urban grain and the relevant theoretical, urban and planning policy context for fine urban grain in the urban centre.

7.4.1 Terms and concepts around fine urban grain

The first research objective sought to establish a clear understanding of the terms, concepts and claims around fine urban grain. It was included as it was clear that the definition and concepts around fine urban grain were prerequisites for carrying out the research, and at the same time urban grain and the key concepts around it were the subject of some confusion in the literature. The research was successful in identifying the different interpretations of fine urban grain and its scope by considering the current literature in a range of areas, spanning big established theory and smaller aspects of professional practice and guidance.

In establishing a robust definition and scoping for urban grain, the research can assist in removing the ambiguity and general confusion in the theory around what components and to what scale the term 'urban grain' applies. It is also recommended that the term 'urban grain' be applied solely to the patterning of plots within the urban block and not to the patterning of urban blocks. As an alternative, new terms for both could be adopted, such as 'plot grain' and 'block grain'.

Surprisingly, the literature review turned up no technique for measuring urban grain. To get around this obstacle, a small study of urban grain was carried out to establish basic metrics. It was combined with elements of theory, guidance and practice and it was successful in providing metrics or 'rules of thumb' for small plots and fine urban grain. These metrics were essential in distinguishing fine urban grain from coarse urban grain and played an important part in developing a new grid-based approach for measuring the urban grain of the case study areas (as discussed in more detail in section 7.5.1). In providing new metrics and techniques for measuring urban grain the research provides a replacement for the current, loose terminology in the literature and a useful basis and benchmarks for measurement and gauging of fine urban grain in future studies.

The literature review highlighted the relationship between fine urban grain and urban form and the various processes of change, which affect urban grain. The research

also found that these processes were poorly understood outside the discipline of urban morphology. This research can be used to inform new theory and practice, in particular, around the important role that it plays in the hierarchy of the urban form of all places.

The research was triggered by the prevailing claims in the theory and practice guidance for the benefits of fine urban grain for the urban centre. The research found that there was an eclectic set of claims for fine urban grain, but that they all had implications for the diversity of urban centres. The research highlighted the importance of diversity as a key theoretical and policy concept. Although diversity comprises many different physical, social and economic dimensions, it was found that mix of uses, ownership and businesses were inherent to it. The research also highlighted the central role of diversity in the key planning objectives of vitality and viability of urban centres.

It was found that the claims varied in terms of their robustness. Claims around the benefits of fine urban grain for streetscape and street life were found to be well researched with adequate underpinning evidence, whereas claims around benefits for mix of uses, mix of ownership and mix of business were poorly researched and heavily reliant on rhetoric and experiential knowledge. Other claims, based on natural laws and patterns, were also present in the literature, however, they were not investigated further as they were highly theoretical and within a very different epistemology based on natural laws and *a priori* assumptions.

The set of claims around benefits for mix of uses, mix of ownership and mix of business were chosen as the focus of this research. In identifying and categorising the claims for fine urban grain and placing them in a theoretical framework, a key objective of the research was achieved.

7.4.2 The essential theoretical, urban and policy context

The second objective of the research was to set out the relevant theoretical, urban and policy context of the urban centre. The literature review took a broad approach, delving into different areas of theory, policy, guidance and practice at different scales. The research found that the planning system and the property development sector has played a central role in the loss of fine urban grain in the urban centre.

The research included a comprehensive planning policy review, which found an ambiguous approach to fine urban grain in the planning systems in Ireland and Britain. It found, that while planning policies tended to focus on town centre first approaches, they often promoted and facilitated redevelopment through the amalgamation of small plots in the remaining fine urban grain of the urban centre, particularly in the secondary streets and spaces where little or no heritage protection was conferred by the planning system.

Significantly, the review of current and recent planning policy uncovered the very central role of diversity, and in particular mix of uses, activities and businesses in achieving the key objectives of vitality and viability in the urban centre. These twin objectives are without doubt the central pillars of current planning policy for urban centres in both Ireland and Britain. This serves to further underline the significance of this research and its implications for practice.

The research highlighted the current preferences of the development sector for larger scale, homogenous redevelopment in the urban centre, which often required plot amalgamation and consolidation and the destruction of fine urban grain. The research also found little evidence of new fine urban grain development in urban centres in Ireland, Britain or across Europe.

7.4.3 Research methodology

The third objective of the research was to develop and implement a research methodology for investigating key claims for fine urban grain in the urban centre. A bespoke research design was needed as there had been no previous attempt to investigate the different claims for fine urban grain in the same inquiry, and there was little in the way of empirical evidence or benchmarks. The research methodology adopted a deductive, real-world approach within the epistemology of critical realism. This allowed for a mixed methods approach where a number of variables could be considered simultaneously using a range of techniques.

The research methodology was based on a conceptual model, which identified the research system, and boundaries, the independent variable (urban grain), the dependent variables (mix of use, mix of ownership and mix of business) and the hypothesised relationships between the variables. Overall, the research design proved to be unified, robust and manageable. Significantly, it provided a clear framework

for the variety of existing and newly-developed techniques necessary to fulfil the research aim and questions.

The research highlights the value of the case study approach in the investigation of urban form. The strength of the approach in delivering quantitative evidence is obvious when compared to the prevailing rhetoric in the area. The research also shows that the case study is ideal for investigations into social and economic phenomena such as mix of uses, ownership and business. The value of choosing two case studies to highlight contrasting urban grain was also evident in providing the ability to change the independent variable (urban grain) and allowing meaningful comparative study, and this was particularly important given the absence of directly related benchmarks.

Importantly, the research design and the techniques employed are eminently replicable. The data were collected from common sources using basic collection and collation techniques. The digital city map proved to be an adequate base on which to identify and categorise the urban form. The land use survey, for example, is a long-established technique in urban planning with existing protocols and it was easily transformed and overlaid on the analysis for urban grain. The use of GIS from the outset proved to be a good decision, as it provided an industry and research standard framework for both data collection and advanced spatial analysis. It also proved to be very amenable to the development of new techniques for measuring urban grain and mix of use.

The research design also contributes new, advanced spatial analysis techniques (UGI and MUI) for measuring urban grain and land use mix to the existing theory. In providing these, the research addresses a well-documented gap in the knowledge in measuring and generalising urban form and other social and economic phenomena at local level. The techniques are also designed for use in professional and practice milieus (this is discussed further in section 7.6). The sampling of businesses and the social survey to establish business relationships was another case where a common technique fulfilled the needs of the research and avoided the need for more extensive surveying.

7.5 Implications of the findings for theory

Having established the essential theoretical and policy context and completed the research design, the research moved on to data collection and analysis. As was shown in the conceptual model (Chapter 4, Figure 4.1) the research focused on establishing the relationships between the independent variable (urban grain) and the dependent variables (Mix of use, ownership and business), for which claims had been made. To recap on these claims, it was argued in the literature that fine urban grain:

- Provided for greater mix of use in the urban centre;
- Provided for greater mix of ownership in the urban centre; and
- Provided for greater mix of business in the urban centre.

7.5.1 Claim for mix of use

The first claim was that fine urban grain provided greater mix of use in the urban centre. The research suggests that the causality behind urban grain and mix of uses is most likely based on the fact that the smaller plots typical of fine urban grain determine the smaller nature of the building on the plot and that this results in many small elements and higher levels of complexity, including mix of use.

The research shows that fine urban grain makes a strong contribution to diversity in the urban centre by providing a high level of mix of use. In doing this fine urban grain makes a significant contribution to the vitality and viability of urban centres. Fine urban grain also makes an important contribution to urban regeneration by providing the mix of uses that is essential in attracting and retaining of urban centres.

The research also shows that coarse urban grain results in lower levels of mix of use. It is clear that the loss of fine urban grain through the redevelopment process, which has involved small plot amalgamation, has had a major role in this regard. In this way loss of fine urban grain has had a damaging effect on the diversity of urban centres.

The research found that on an area basis, there was a clear relationship between the fine urban grain and greater mix of use. The close relationship was also evident at the more detailed level of the small plot and small plot clusters. It found that, conversely, there was a demonstrable relationship between the coarse urban grain and lower levels of mix of use on an area basis and at the level of the individual large plot.

The research provides support for the normative and unsupported claims, which identified the important role of the mix of use in the sustaining the city and the close relationship between built form. It also supports the claim connecting mix of uses and fine urban grain and the role that they play in securing a range of local, socio-economic benefits. Crucially, the research supports and provides better traction for the endorsements which link mix of use with fine urban grain in current planning and urban design guidance.

The success of the research techniques highlights the effectiveness of entropy-based models deployed in land use mix models and correlative analysis in measuring the mathematical strength of relationships in local level research such as this. The research also proves the need for, and effectiveness of, the 3-dimensional approach in the new MUI technique, in terms of accuracy and better representation of real world conditions (The implications of the new techniques for practice are considered in section 7.6).

7.5.2 Mix of ownership

The second claim was that fine urban grain enhanced or provided greater levels of mix of ownership in the urban centre. The research indicates that the causality behind urban grain and mix of ownership is based on the fact that the small spaces that small businesses require and can afford are more numerous and more extensively distributed in fine urban grain than they are in coarse urban grain in the urban centre. Importantly, it was established from the literature that these smaller businesses tended to be independently-owned.

The research found that on an area-wide basis there was a positive relationship between urban grain and mix of ownership. In particular, it shows that finer urban grain leads to greater proportions of independent ownership on an area-wide basis and at the level of the plot, and that coarser urban grain leads to greater proportions of multiple or chain ownership on an area-wide basis and at the level of the plot. It is also clear that multiple or chain ownership is dominant on primary shopping streets and that this has a significant and skewing effect on area ownership patterns.

The research supports the contention that fine urban grain helps to diversify the urban economy by encouraging and hosting independent ownership and it supports the contention that fine urban grain is attractive to independent business as it provides

more accessible and affordable spaces. By extension the research may support the rhetorical claims for the benefits of fine urban grain for urban regeneration. In terms of practice, it underpins the endorsement of fine urban grain in current planning and urban design guidance on the basis of its role in securing diversity of tenures. Finally, it supports and recontextualises dated research which found a significant decline in independent ownership and a corresponding increase in multiple or chain ownership following the comprehensive (coarse urban grain) redevelopment of traditional, mixed use areas in the city centre.

7.5.3 Mix of business

Mix of business is the third claim investigated in this research. It has three distinct aspects. The first is that fine urban grain provides for a greater diversity of businesses. The second is that fine urban grain is a necessary component or condition for the evening economy. The third aspect of the claim is that fine urban grain plays a role in developing better local business relationships. The research established that the causality was based on the suitability of the small workspaces that fine urban grain provides to small businesses and evening uses. As with the mix of uses and mix of ownership, this claim was found to be based largely on rhetoric and experiential knowledge.

The research shows that there is a strong relationship between urban grain and mix of business. In particular, the research shows that urban grain plays a key role in business density in the urban centre. Using a range of techniques, including GIS and correlative and descriptive statistical analysis, the research found that on an area-wide basis there was a strongly positive relationship between urban grain and mix of business.

It is also apparent that fine urban grain areas and urban blocks produce substantially greater business density than the coarse urban grain as the smaller buildings and workspaces provided by fine urban grain are preferred by smaller businesses. Notably, multi-level shopping centres make a small but important contribution to business density, despite their larger unit sizes. In contrast, single level shopping centres and department stores produce low levels of business density.

The research shows that fine urban grain areas host a substantially greater density of evening uses than coarse urban grain and that the density of evening uses in coarse urban grain area is extremely low. It also shows that evening uses tend to cluster in smaller units on secondary streets in areas of fine urban grain. It is also likely that there is very little prospect of developing evening uses in shopping centres, malls, arcades and other building complexes.

Interestingly, the research suggests that evening uses are displaced from primary shopping streets by multiple/chain retailers (this was also noted in the survey of ownership). It also indicates that a critical mass for the effective clustering of evening uses may no longer be achievable in areas of coarse urban grain with heavily depleted fine urban grain.

The research shows that fine urban grain provides the conditions for better local business relationships and associations, although other factors, such as length of time in operation, are important. Local business relationships are mostly maintained between small businesses of a similar nature or by businesses that provide related services or deals for the staff. Also, the younger nature and greater turnover of businesses in fine urban grain may reflect the greater suitability of fine urban grain for new businesses.

The research also provides much needed empirical support for previous claims and studies, which have not benefited from robust empirical evidence. It supports concerns about the loss of business and activity diversity through loss of fine urban grain and comprehensive redevelopment. It also supports claims around fine urban grain, its role in providing mix of business and the regeneration of urban centres more generally.

Specifically, the research highlights the role of fine urban grain in providing the variety and adaptability of the building stock and the active frontages that are essential to achieving mix of business and contributing to diversity of business in the urban centre. It also shows the importance of fine urban grain in revitalising the secondary streets and lanes of city centres and broadening the range of business types and owners, in particular small bars and restaurants.

7.5.4 Significance of the research for theory

The research has shown that a strong relationship exists between urban grain and mix of uses, and that finer urban grain leads to greater mix of use. The research also verifies the claims made in this area and adds empirical evidence to the rhetoric. The relationship between fine urban grain and greater mix of uses is highly significant as mix of use is almost ubiquitous in the literature, with its benefits widely acclaimed by many and at different levels and scales in the urban environment. Anything that can protect or enhance mix of uses is of significance, and makes an important contribution to diversity.

The research confirms that a positive relationship between urban grain and mix of ownership exists, with finer urban grain leading to greater mix of ownership. The research also verifies and clarifies aspects of the claim made in this area and it adds empirical evidence to the rhetoric underpinning the claim. The relationship between fine urban grain and greater mix of ownership is highly significant as mix of ownership plays a key role in the key planning objectives of vitality and viability of urban centres.

The research has also shown a strong relationship between urban grain and mix of business, with finer urban grain leading to greater mix of business. The research verifies the claims made in this area by replacing the underpinning rhetoric with empirical evidence. The finding is of particular significance as mix of business is essential to the vitality and viability of urban centres by expanding local economies and providing a range of agglomeration benefits. Mix of business is a key element in broadening the role and expanding the economy of urban centres and it provides the resilience needed to manage changing social and economic contexts, which can have profound impacts on the urban centre.

Although cause and effect cannot be established between mix of use, mix of ownership and mix of business, these variables are likely to overlap and they may have feedback loops or reinforcing characteristics. Taken together they provide a major contribution to diversity, which is one of the most fundamental concepts of urban and planning theory. Indeed their contribution to diversity may only be fully appreciated when the other claims for fine urban grain around streetscape and street life are included in the consideration.

7.6 Implications and recommendations for practice

The research has significant implications for current practice at different levels. The research highlights ambiguities in practice around the terms and concepts of fine urban grain. To address this, the research provides a simple and workable interpretation of fine urban grain. As discussed in the implications for the theory, it is recommended that this term be applied solely to the patterning of plots within the urban block and not to the patterning of urban blocks, as sometimes occurs in practice. As an alternative, new terms for both patterns could be adopted, such as 'plot grain' and 'block grain'. These terms should be clarified in existing planning policy and urban design guidance.

At a more general level, the research highlights the need to improve the awareness of fine urban grain and its benefits among practitioners. This will require the dissemination of the findings of the research into the professional milieu and their inclusion in the education of built environment professionals, particularly planners. The poor understanding of fine urban grain is, unfortunately, part of a larger problem in planning practice. In Ireland and Britain, planning policy on urban form is undeveloped and it is often highly generic in nature with very little in terms of specifics. This is notable in the area of the generalisation and measurement of local urban form. Additionally, there remains little research or discussion in higher-level policy on the role of urban form and what might constitute more sustainable urban forms at local level. This research highlights the value and importance of research into urban form and its relationship with important social and economic variables such as mix of uses and activities. More specifically, the findings of the research should be included in future discussions and debates in practice around the redevelopment of existing urban centres.

This research confirms that aspects of local level urban form have a very significant impact on diversity and the vitality and viability of urban centres. Given the importance of these objectives to urban centres, Local Authorities should, at the very least, be attempting to gain a better understanding of this local level urban form and its relationship with other key social and economic variables in framing their plans and policies. To assist them in this task, specific guidance on urban grain should now be included as part of a new set of statutory planning guidance for local level urban form. Although the existing, non-statutory urban design guidance and practice publications have been largely ineffective in influencing practice around fine urban grain, they would benefit from updating and would provide support for statutory

guidance. The research could also assist in improving current definitions, objectives and techniques around urban grain and local urban form.

The research highlights that current planning policy for the urban centre in Ireland and Britain is ambiguous as far as fine urban grain is concerned. The current set of policies around the urban centre, where the town centre first principle is foremost, is likely to focus redevelopment towards the remaining areas of lower value and unprotected fine urban grain. While this may appear necessary to secure the vitality and viability of urban centres, and may make short-term development sense, it is likely to lead to the destruction of fine urban grain. This is likely to damage the diversity of the urban centre, particularly if levels of fine urban grain are already depleted.

The research has shown that high levels of vacancy can result from speculation and site amalgamation, and this can threaten vitality and viability of the urban centre. Planning policy and practice should address these outcomes by adopting the precautionary principle where, as a default, amalgamation and redevelopment of fine urban grain in urban centres is not permitted as it is not likely to be replaced once lost. At the very least, planning policy should require that there is a proper assessment of the longer-term value and potential of fine urban grain and a clear understanding of the impacts of its loss on the diversity of the urban centre. This is essential to inform proper local plan-making and development management.

There may also be an argument for addressing the current legislative basis for regulating urban grain. Where fine urban grain has reached a critically low or depleted level or where it is essential to the diversity and the vitality and viability of the urban centre, it should be afforded statutory protection, beyond the limited scope of the planning legislation that currently exists in Ireland and Britain. This may require special planning controls of ownership, subdivision and amalgamation, similar to those in other jurisdictions. This is not a new concept for planning systems, internationally. For example, New South Wales, Australia effectively integrates control over development and the subdivision/amalgamation of the plot. Fine urban grain should also be considered as a alternative typology for proposed new developments, or as an element of proposed new developments, in urban centres. This would be particularly appropriate where existing levels of fine urban grain are depleted or where enhanced diversity is targeted.

The research identifies the role of the local spatial plan in protecting fine urban grain. The local spatial plan has the potential to set out a range of policies and objectives to protect and deliver fine urban grain in the urban centre. It also has the potential to engage the local community and raise greater awareness of the benefits of fine urban grain. Clear policies based on longer-term diversity, particularly around mix of uses, ownership, business and evening economy will also improve the dialogue and confidence of developers and investors in the urban centre. Local spatial plans could also provide the framework for more detailed master plans or detailed urban design codes, which could address fine urban grain in greater detail.

Local Authorities should not become a party to the loss of fine urban grain where this will damage the diversity of the urban centre. In the past, they have been actively involved in facilitating site assembly through compulsory purchase and other special powers, and current policy requires them to take a proactive role in seeking development opportunities in urban centres (CLG, 2012, DECLG, 2012). This again highlights the importance of robust assessment of the extent and benefits of fine urban grain and the appropriateness of local spatial planning processes. In a more proactive manner, Local Authorities could become the guardians of fine urban grain using these same powers to acquire and manage land. This sort of intervention could be justified where fine urban grain is seriously depleted or where it is of particular importance to the diversity of the urban centre. Despite their suitability to many uses, the research highlighted the extent of upper floor vacancy in upper floors in fine urban grain. Local Authorities should play a more active role in activating these spaces in fine urban grain. There have been similar initiatives in the past, such as the 'Living over the Shop' schemes of the 1980s and 1990s in Ireland and Britain.

Finally, diversity and the vitality and viability of urban centre rely not just on measures targeted at the urban centre, but also on measures to control the development of the urban edge. Unfortunately, the research shows that many urban centres are still struggling with the processes of decline and decentralisation with ever increasing competition from the urban edge. All efforts to maintain the diversity of the urban centre will be for nothing if a more stringent approach to the development of the urban edge is not taken. This may include more proactive approaches at the edge, including moratoriums on further development, financial incentives and penalties, improvement and control of access and local taxation measures.

A significant contribution of this research to practice is the development and the successful application of two, advanced spatial analysis techniques in this research. The first is the UGI (Urban Grain Index) developed in this research for the measurement and analysis of urban grain. It fills a notable gap in the measurement of and generalisation of urban form. UGI provides a basic and easily replicable technique, which is within the scope and expertise of most researchers and Local Authorities. It uses industry standard GIS and draws from data sets that are available to, or could be garnered by, most Local Authorities. The research clearly shows the objectivity and the clarity of the technique and it was shown to be successful in providing advanced spatial analysis of the case study areas.

The second is the MUI (Mixed Use Index), which was developed in this research to provide an objective and detailed measurement of mix of use at the level of urban grain, that factors in the horizontal and vertical and vertical mix of uses that is typical of urban centres. It consists of a straightforward measurement and analysis technique for mix of uses that is particularly suitable for urban centres, but could also be applied more extensively to other urban contexts. This technique should also be within the scope and competence of most researchers and Local Authorities. MUI also uses industry standard GIS and draws from data sets that are commonly available or could be generated by most Local Authorities. Importantly, the techniques developed in this research are suitable for the measurement and generalisation of a wide range of local level variables.

7.7 Limitations of the research

The research design was based on a case study approach, which can have limitations in terms of the theoretical generalisation of the findings. Two case studies were chosen to mitigate this potential limitation and they were chosen so that the independent variable (urban grain) could be changed to establish the impacts of that change on the dependent variables. The choice of two case studies was also in line with accepted research practice and was in fact recommended, if resources permitted, to make the case study findings more compelling overall. In addition, the case study bias was limited by the author's knowledge of the area. A much larger survey of a large urban centre, rather than selected case study areas within the city centre, would have improved the nature of the data and the significance of the findings. However, this would have been a considerable undertaking, which would have been well

outside the resources of this research. In any event, the research design was considered adequate to meet the research aim and questions.

Aspects of the data available to the research were inadequate. The historical land use data from Dublin City Council (from 2000) were of limited value as they were incomplete and this meant that a longitudinal study was not possible. This is not considered to be of great significance to the research as case study is most commonly 'snapshot' in nature. The digital Ordnance Survey Ireland base mapping was also poor in some respects. In some instances it was difficult to distinguish the plot among the mapping detail of structures and buildings at ground level. For example, there were cases where ground floor subdivisions with their own postal addresses appeared as separate plots. This limitation was, however, addressed by the author's revisions. This points to a need for practitioners, such as planners and urban designers to engage with mapping and data collection agencies in setting out their needs for base mapping, particularly in more complex urban contexts such as urban centres.

The land use survey was based on the existing and current practice guidance for land use survey. These categories, however, are quite basic and there is an argument that these could be much more refined for the urban centre. This is certainly possible, however, the benefit of the existing practice is that it is manageable in terms of computation and it can be benchmarked against other land use surveys. The surveys of ownership recorded principal ownership of ground floors and upper floors only. It was not possible to get access to the interior of buildings and as a result exact extents could not be established. The footprint of business premises was more difficult to ascertain and in some cases there were many businesses on a single floor. For this reason, the data were pinpointed rather than recorded in vector format. Substantial additional resources and the appropriate permissions would be needed to address issues of accuracy in these footprints. Notwithstanding, it is considered that the research design in this area fulfilled the research aim and questions.

The social survey of local business relationships was limited in terms the sample size. Additional survey would make the results around business relationships more representative. The survey was relatively concise, given the range of claims and techniques used in the research. This survey could be elaborated to delve in more detail into business interactions and relationships in urban centres. This would no

doubt result in a compelling qualitative study. However, the sample and survey are considered acceptable given the research objectives and the resources available to the author.

7.8 Recommendations for future research

There are a number of areas in which future research could be targeted. A number of these arise from the limitations of the research. They are:

- Research of a larger case study area, which could pick up a range of functional areas within the urban centre. This would improve the data and allow for random selection. This study could also extend to other urban centres in Ireland, Britain or beyond, using the techniques developed in this research. This would be very useful in testing the research design and providing the much needed benchmarks for urban grain and mix of uses. This would assist greatly in generalising and categorising urban grain.

- More detailed research on business ownership and type, which could be carried out for selected city centre areas. This could accurately map and measure the extent of businesses and include surveys of the occupants and it could include a more extensive questionnaire of occupants around pros and cons, opinions of the location and the building or the workspace and relationships with other businesses in the area. This could give a deeper qualitative understanding of mechanisms and provide for better benchmarks for business size and density and related activities such as employment density.

- Further research on the use of GIS in the research design. This would allow the techniques developed in this research to be reviewed and refined to improve ease of computation of the collected data through improved and more efficient coding and analysis.

7.9 Conclusions on the research

At its most basic, theory is about the connection or the cause and effect between variables and '…an explanation of what is going on in the situation, phenomenon or whatever that we are investigating.' (Robson, 2011: p.61). This research has focused on explaining the theory around fine urban grain and investigating its relationship

with variables of significance for diversity and the vitality and viability of urban centres. As with all research its success can only be measured against its stated research aim and objectives. It is appropriate then to conclude this thesis with a brief reflection on how it has met its research aim and objectives, dealing firstly with the research objectives.

1) Does the research establish a clear understanding of the terms, concepts and claims around urban grain in the urban centre?

The research has set out clearly and unambiguously the key terms and concepts around urban grain, and in doing so it clarifies a commonly misunderstood component of urban form. The research delves into a wide range of theory and policy to identify the main claims around fine urban grain. It highlights the role that fine urban grain is claimed to play in diversity and the vitality and viability of urban centres. It considers where the gaps in the knowledge in this area lie and it identifies the claims that are in need of investigation.

2) Does the research establish the relevant theoretical, urban and planning policy context for the urban centre?

The research has set out clearly and unambiguously the range of theory and policy around the urban centre. It also highlights the central role of diversity in urban and planning theory and the importance of the objectives of vitality and viability for urban centres. The research also considers the role of the planning system and the property development sector in regulating, shaping and transforming urban grain.

3) Does the research develop and implement a research methodology for investigating key claims around mix of use, ownership and business for fine urban grain in the urban centre?

The research presents a conceptual model on which a robust methodology with a clear strategy for dealing with the different research variables is based. The methodology is based on a 'real world' approach where the design is flexible and mixed techniques are employed to suit the nature of the claims. The methodology is considered to be robust, particularly in terms of data collection, data analysis and its potential for replication, in part or in full, in future studies.

4) Does the research critically analyse and interpret the findings of the research and their implications for the current theory?

The research presents in-depth and advanced spatial and statistical analysis of the findings. The research discussion includes an interpretation of the findings against the current theory and policy in the area. The research considers the implications of the findings by clarifying, verifying and challenging the claims in the current theory.

5) Does the research provide policy and practice recommendations for urban grain in the urban centre?

The implications of the research across different levels of planning policy and practice in Ireland and Britain are set out. Key recommendations are made across the range of planning practice. The research also identifies the limitations of the research and recommends areas for future academic and practice research.

Given the success of the research in meeting the research objectives, it is considered that the overall research aim, which is to determine the effects of fine urban grain on the diversity of the urban centre, has been achieved.

REFERENCES

Alexander, C. (1977) *A Pattern Language.* New York: Oxford University Press.

Alexander, C., Neis, A., Anninou and I., King (1989) *A New Theory of Urban Design.* New York: Oxford University Press.

Anders, S. (2012) The DGNB Certification System: New Mixed City Districts. In: International Federation of Municipal Engineering. *World Congress on Municipal Engineering: Sustainable Communities.* Helsinki, 5 June 2012.

Barton, H. (2000) *Sustainable Communities: The Potential for Eco-Neighbourhoods.* London: Earthscan Publications Ltd.

Barton, H., Grant, M. and Guise, R. (2010) *Shaping Neighbourhoods: For Local Health and Global Sustainability*. 2nd ed. London: Routledge.

Bennison, D.J. and Davies, R.L. (1980) The Impact of Town Centre Shopping Schemes in Britain: Their Impact on Traditional Retail Environments. In: Diamond, D. and McLoughlin, J.B., eds. (1980) *Progress in Planning,* 14(1), pp.35-82.

Bentley, I., Alcock, A., Murrain, P. and McGlynn, S. (1985) *Responsive Environments: A Manual for Designers.* Oxford: Architectural Press.

Bernard, H.R. (2000) *Social Research Methods: Qualitative and Quantitative Approaches.* London: Sage Publications Ltd.

Best, K. (2010) *The Fundamentals of Design Management.* Lausanne, Switzerland: AVA Publishing SA.

Biddulph, M. (2011) Urban design, regeneration and the entrepreneurial city. *Progress in Planning.* 76 (2), pp. 63-103.

Bissett, M. (2008) *Urban Regeneration: Public Good or Private Profit?* Dublin: TASC/New Island.

Bordoloi, R., Mote, A., Pratim Sarkar, P. and Millikarjuna, C. (2013) Quantification of land use diversity in the context of mixed land use. In: 2nd Conference of Transportation Research Group of India. *Procedia - Social and Behavioral Sciences*. 104 (2013), pp. 563-572.

Bristol Partnership (2009) *The Bristol 20:20 Plan: Bristol's Sustainable City Plan.* Bristol: Bristol Partnership

Campbell, K. (2011) *Massive Small: The Operating Programme for Smart Urbanism.* London: Urban Exchange.

Cannon, R. (2011) Legal issues for the urban plots. Interviewed by Conor Norton. PhD Thesis. 4th November 2011. [Interview]

Carmona, M., Heath, T., Oc, T. and Tiesdell, T. (2003) *Public Places Urban Spaces: The Dimensions of Urban Design.* Oxford: Architectural Press.

CSO (Central Statistics Office) (2015) *SAPMAP 2011*. Available at: [http://census.cso.ie/sapmap/]
Accessed on 10th March 2015.

Centre for Advanced Spatial Analysis (2000) *Town Centre Vitality and Viability: A Review of the Health Check Methodology.* A report for the National Retail Planning Forum. London: University College London.

Chapple, K (2015) *Planning Sustainable Cities and Regions: Towards more Equitable Development.* Abingdon, Oxon: Routledge.

Chase, J., Crawford, M. and Kaliski, J. (2008) *Everyday Urbanism: Expanded.* New York: The Monacelli Press.

City of Amsterdam, Physical Planning Department (2006) *Eastern Harbour District, Amsterdam: Urbanism and Architecture.* Rotterdam: NAi Publishers.

Civic Amenities Act 1967. London: HMSO.

Claus, F., Dongen, F. van and Schaap, T. (2001) *IJburg: Haveneiland and Rieteilanden*. Rotterdam: 010 Publishers.

Clelland, D. and Schäche, W. (2009) *Berlin 1989-2009: Part 1.* Architecture Today. [Online] Available at: http://www.architecturetoday.co.uk/?p=1484
Accessed on 17th November 2011.

CLG (Department for Communities and Local Government) (1996) *Planning Policy Guidance Note 6: Town Centres and Retail Developments (PPG6)*. London: CLG.

CLG (Department for Communities and Local Government) (2012a). *National Planning Policy Framework*. London: CLG.

CLG (Department for Communities and Local Government) (2012b). *Re-imagining Urban Spaces to Help Revitalise our High Streets*. London: CLG.

CLG (Department for Communities and Local Government) (2013) *National Planning Practice Framework*. London: CLG.

Clifton, K., Ewing, R., Knaap, G-J. and Song, Y. (2008) Quantitative analysis of urban form: a multidisciplinary review. *Journal of Urbanism: International Research on Placemaking and Urban Sustainability*. 1 (1), pp. 17-45.

Colorado State University, (2015) *Conceptual model: research planning workshop.* [online]. Available at:
http://warnercnr.colostate.edu/docs/hdnr/mor2/Fernandez_DesignWorkshop.pdf
[Accessed on 12th December 2014]

Commission of the European Commission (1990) *Green Paper on the Urban Environment: Communication from the Commission to the Council and Parliament.* Com (90) 218, Final. Brussels: CEC.

Conway, H. and Roensich, R. (1994) *Understanding Architecture: An Introduction to Architecture and Architectural History.* London: Routledge.

Conzen, MRG. (1960) *Alnwick, Northumberland: A Study in Town Plan Analysis.* Publication no. 27, 2nd revised edition (1969). London: Institute of British Geographers.

Conzen, M.P. (2001) The Study of Urban Form in the United States. *Urban Morphology*. 5(1), pp. 3-14.

Conzen, M.P., ed. (2004) *Thinking About Urban Form: Papers on Urban Morphology, 1932-1998, M.R.G. Conzen.* Bern: Peter Lang AG.

Cooper, R., Evans, G., Boyko, C. and Adams, M. (2009) *Designing Sustainable Cities: Decision-making Tools and Resources for Design.* Chichester: John Wiley and Sons.

Couch, C. (1990) *Urban Renewal: Theory and Practice.* London Macmillan.

Coupland, A., ed. (1997) *Reclaiming the City: Mixed Use Development.* London: E and FN Spon.

Creswell, J. W. (2002) *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 2nd ed. Thousand Oaks, California: SAGE Publications Ltd.

Crotty, M. (1998) *The Foundations of Social Research: Meaning and Perspective in the Research Process.* London: SAGE Publications Ltd.

Cussen, N. (2011) The role of fine urban grain in the planning system. Interviewed by Conor Norton. PhD Thesis. 15th November 2011. [Interview]

Dai, F.C., Lee C.F. and Zhang, X.H. (2001) GIS-based geo-environmental evaluation for urban land use planning: A case study. *Engineering Geology*. 61 (4), pp. 257-271.

Davidson, F., Payne, G., K. and Payne, G. (2000) *Urban Projects Manual: A Guide to Preparing Upgrading and New Development Projects Accessible to Low Income Groups*. 2nd Ed. Liverpool: Liverpool University Press.

Dancey, C. and Reidy, J. (2007) *Statistics Without Maths for Psychology: Using SPSS for Windows.* 5th ed. Harlow: Pearson Education Ltd.

Department for Business, Innovation and Skills (DBIS) (2011) *Understanding High Street Performance.* London: DBIS.

DOE (Department of the Environment) (1993) *PPG6: Town Centres and Retail Developments.* HMSO: London.

DOE (Department of the Environment) (1996) *PPG6: Town Centres and Retail Developments.* London: DoE.

Department of the Environment and URBED (1994) *Vital and Viable Town Centres: Meeting the Challenge.* London: HMSO.

DECLG (Department of the Environment, Communities and Local Government) (2013) *Manual for Local Area Plans.* Dublin: Government of Ireland.

DECLG (Department of the Environment, Communities and Local Government), (2012a) *Retail Planning Guidelines.* Dublin: Government of Ireland.

DECLG (Department of the Environment, Communities and Local Government), (2012b) *Our Sustainable Future, a Framework for Sustainable Development for Ireland.* Dublin: Government of Ireland.

DECLG (Department of the Environment, Communities and Local Government), (2012c) *Retail Planning Manual.* Dublin: Government of Ireland.

DEHLG (Department of the Environment, Heritage and Local Government), (2009a) *Urban Design Manual.* Dublin: Government of Ireland.

DEHLG (Department of the Environment, Heritage and Local Government), (2009b) *Residential Planning Guidelines.* Dublin: Government of Ireland.

DEHLG (Department of the Environment, Heritage and Local Government), (2007a) *Retail Planning Guidelines.* Dublin: Government of Ireland.

DEHLG (Department of the Environment, Heritage and Local Government), (2007b) *Development Plan Guidelines.* Dublin: Government of Ireland.

DoENI (Department of the Environment, Northern Ireland) (1996) *Planning Policy 5: Retailing and Town Centres.* Belfast: DoENI.

DoENI (Department of the Environment, Northern Ireland) (2014) *A Strategic Planning Policy Statement for Northern Ireland (SPPS): Planning for Sustainable Development. (Draft).* Belfast: DoENI.

DETR (Department of Environment, Transport and the Regions) (2000). *By Design: Urban Design in the Planning System: Towards Better Practice*. London: DETR and CABE.

Dublin BID (Business Improvement District) (2014) *Dublin BID Dashboard Report.* Dublin: Dublin BID.

Dublin City Council (2008) *Dublin City Centre: Developing the Retail Core.* Dublin: DCC.

Dublin City Council (2011) *Dublin City Development Plan, 2011-2017.* Dublin: DCC.

Dublin City Council (2011) *Sustainability Report, 2013.* Dublin: DCC.

Dublin Civic Trust (2012) *South William Street Area Study.* Dublin: Dublin Civic Trust.

DDDA (Dublin Docklands Development Authority) (2001) *North Lotts Planning Scheme.* Dublin: DDDA.

Duddy, C. (2001) The Western Suburb of Medieval Dublin: Its First Century. *Irish Geography,* 34 (2), pp. 157-175.

Dunne, T. (2011) *Property and urban economic issues from small plots.* Interviewed by Conor Norton. PhD Thesis. 1st November 2011. [Interview]

English Heritage (2013) *The Changing Face of the High Street: Decline and Revival. A Review of Retail and Town Centre Issues in Historic Areas*. London: English Heritage.

English Partnerships, (2000) *Urban Design Compendium.* London: English Partnerships and The Housing Corporation.

English Partnerships, (2007) *Urban Design Compendium 2: Delivering Quality and Adding Value.* London: English Partnerships and The Housing Corporation.

Etzioni, A. (1986) Mixed scanning revisited. *Public Administration Review.* 61 (1), pp. 8-14.

European Commission (1995) *European Sustainable Cities Report.* Brussels: EC.

European Commission (2004) *Urban Design for Sustainability*. *Final Report of Working Group on Urban Design for Sustainability.* Expert Working Group on Urban Design for European Expert Group. Brussels: Urban Environment and Environment Directorate of Sustainability.

European Communities (1990) *Green Paper on the Urban Environment.* COM (90) 218 final. Brussels: EC.

Evans, AW. (2004) *Economics and Land Use Planning.* Oxford: Blackwell Publishing Ltd.

Evans, R. (1997) *Regenerating Town Centres.* Manchester: Manchester University Press.

Experian and ATCM (The Association of Town Centre Management) (2012) *Town Centre Futures 2020.* London: Experian Ltd.

Falk, N. (2007) Lessons from Freiburg. *Town and Country Planning.* October, 2007.

Falk, N. (2008) New Communities – Looking and learning from Dutch experience. *Town and Country Planning*. December 2008, pp. 503-508.

Federation of Small Businesses (2010) *Keep Trade Local: Local Solutions to Local Problems.* London: FSB.

Frey, H. (1999) *Designing the City: Towards a More Sustainable Urban Form*. New York: E and FN Spon.

Gehl, J. (1971) *Life Between Buildings*. Skive: Arkitektens Forlag.

Gehl, J. (2010) *Cities for People*. Washington DC: Island Press.

Goes, J., (2002) *Variable, relationships, hypotheses: How to build a good conceptual model* [online]. Available at: http://warnercnr.colostate.edu/docs/hdnr/mor2/Fernandez_DesignWorkshop.pdf [Accessed on 12 December 2014].

Grimsey, B. (2013) *The Grimsey Review: An Alternative Future for the High Street.* [online]. Available at: http://www.vanishinghighstreet.com/wp-content/uploads/2013/09/GrimseyReview04.092.pdf Accessed on 10th January 2014.

Groat, L. and Wang, D. (2002) *Architectural Research Methods.* New York: John Wiley and Sons, Inc.

Hall, P. (1998) *Cities in Civilization: Culture, Technology, and Urban Order.* London: Weidenfeld & Nicolson.

Havard, T. (2008) Contemporary Property Development. 2nd Edition. London RIBA

Healey, P. (1994) Urban policy and property development: the institutional relations of real-estate development in an old industrial region. *Environment and Planning A*. Vol. 26, pp. 177-198.

Hess, P., Moudon, AV. and Logsdon, MG. (2001) Measuring Transportation Land use patterns for Transportation Research. *Transport Research Record, 1780*, pp.17-24.

Haughton, G. and Hunter C. (1994) *Sustainable Cities*. London: J. Kingsley Publishers.

Jackson, C. and Watkins, C. (2011) Planning Policy and Retail Property Investment in the UK. *Urban Studies*. 48(11), pp. 2321–2338.

Jacobs, Allan (1993) *Great Streets*. Cambridge, MA: MIT Press.

Jacobs, J. (1961) *The Death and Life of Great American Cities*. New York: Random House Inc.

Jacobs, J. (1969) *The Economy of Cities*. New York: Random House Inc.

Javelin (2012) *Battlefield Britain: Survivors and casualties in the battle for the high street*. Javelin Group White Paper. London: Javelin.

Jenks, M. and Jones, C., eds. (2010) *Dimensions of the Sustainable City (Future City 2)*. Heidelberg: Springer.

Jones, P. and Evans, J. (2008) *Urban Regeneration in the UK: Theory and Practice*. London: SAGE Publications Ltd.

Jones, P., Roberts M., and Morris, L. (2007) *Rediscovering Mixed-use Streets: The Contribution of Local High Streets to Sustainable Communities*. Bristol: The Policy Press.

Kaliski, J. (2008) The Present City and the Practice of City Design. In: Leighton Chase J., Crawford, M. and Kaliski, J. eds. (2008) *Everyday Urbanism* 2nd ed. New York: The Monacelli Press.

Kärrholm, M. (2011) The scaling of sustainable urban form: A case of scale-related issues and sustainable planning in Malmö, Sweden. *European Planning Studies,* 19(1), pp. 97-112.

Keane, D., Doyle, A. and Gocur, I. (2011) *Planning and Land Use Trends 1990-2011: Dublin City BID.* Dublin: Dublin City Business Improvement District.

Keeping, M. and Shiers, DE. (2004) *Sustainable Property Development: A Guide to Real Estate and the Environment.* Oxford: Blackwell Science Ltd.

Knight, D. and Monteiro, C. (2012) Plotting. [Online] Available at: http://www.revistapunkto.com/2011/09/plotting-david-knight-cristina-monteiro.html Accessed on 6th January 2014.

Kostof, S. (1991) *The City Shaped.* London: Thames and Hudson Ltd.

Kropf, K. (2005) The handling characteristics of urban form. *Urban Design Quarterly.* Winter 2005 (93), pp. 17-21.

Larkham, P. (2005) Understanding urban form? *Urban Design*, Winter 2005, (93), pp. 22-24.

Lawrence, N. W. (1997). *Social Research Methods: Qualitative and Quantitative Approaches.* 3rd ed. MA: Allyn and Bacon.

Lennon, C. (2008) *Irish Historic Towns Atlas No.19, Dublin. PART II, 1610-1756.* Dublin: Royal Irish Academy.

Loci (2010) *Losing the Plot*. Practice Report. Dublin: Loci.

Longley, PA. and Mesev, V. (2000) On the measurement and generalization of urban form. *Environment and Planning A.* (32), pp. 473-488.

Love, T. and Crawford, C. (2011) Plot Logic: Character-Building Through Creative Parcelisation. In: Tiesdell, S. and Adams D. (2011) *Urban Design in the Real Estate Process*. London: Blackwell Publishing Ltd.

Lynch, K. (1964) *The Image of the City.* Cambridge, MA: Harvard University Press.

Lynch, K. (1981) *Good City Form.* Cambridge, MA: MIT Press.

Ma, Y., Chen, X. (2013) Geographical and statistical analysis on the relationship between land-use mixture and home-based trip-making and more: Case of Richmond, Virginia. *Journal of Urban and Regional Studies.* V(1), pp. 5-44.

MacLaran, A. (2005) Suburbanising Dublin: Out of an Overcrowded Frying Pan and into a Fire of Unsustainability. In: Moore, N. and Scott, M., 2005. *Renewing Urban Communities: Environment, Citizenship and Sustainability in Ireland.* Aldershot, Hamphire: Ashgate.

McCullough, N. (2007) *Dublin - An Urban History: The Plan of the City.* Dublin: The Lilliput Press.

McNeill, D. (2011) Fine grain, global city: Jan Gehl, public space and commercial culture in central Sydney. *Journal of Urban Design*. 16(2), pp. 161-78.

Malczewski, J. (2004) GIS-based land-use suitability analysis: a critical overview. *Progress in Planning.* 62, pp. 3–65.

Marshall, S., ed. (2011) *Urban Coding and Planning.* Abingdon, Oxfordshire: Routledge.

Maxwell, J.A. (2013) *Qualitative Research Design: An Interactive Approach.* 3rd Ed. London: SAGE Publications.

Mehta, V. (2013) *The Street: The Quintessential Social Public Space.* Abingdon, Oxon: Routledge.

Montgomery, J. (1998) Making a City: Urbanity, Vitality and Urban Design. *Journal of Urban Design.* 3(1), pp. 93-116, 98.

Montgomery, J. (2003) Cultural Quarters as Mechanisms for Urban Regeneration. Part 1: Conceptualising Cultural Quarters, *Planning Practice and Research*. 18(4), pp. 293-306.

Morris, A.E.J. (1994) *History of Urban Form: Before the Industrial Revolution.* 3rd ed. Harlow, Essex: Longman Scientific and Technical.

Morton, A. and Dericks, G. (2013) *21st Century Retail Policy: Quality, Choice, Experience and Convenience.* London: Policy Exchange.

Moudon, AV (1994) Getting to know the built landscape: typomorphology. In: Franck KA. and Schneekloth, LH. (1994) *Ordering space: types in architecture and design.* New York: Van Nostrand Reinhold.

Moudon, AV. (1988) *The City of the 21st Century.* Conference proceedings for the City of the 21st Century Conference, April 7-9, 1988. Department of Planning, College of Architecture and Environmental Design, Arizona State University, Tempe, Arizona.

Moughtin C., (2003) *Urban Design: Street and Space.* 3rd ed. Oxford: Architectural Press.

Musakwa, W. and van Niekerk, A. (2012) Implications of Land Use Mix on the Sustainability of African Urban Centres: A Case Study of Stellenbosch, South Africa. In: Schrenk, M., *et al.*, Eds., 2012. *Re-mixing the City: Towards Sustainability and Resilience?* Proceedings of REAL CORP 2012, 14-16th May 2012, Schwechat, Austria.

Musakwa, W. (2013) Developing an urban sustainability toolbox using earth observation data and GIS for monitoring rapid urbanisation in developing countries. *Urban sustainability Toolbox.* 49th ISOCARP Congress 2013.

National Transport Authority (2013) *City Centre Transport Assessment Study.* Dublin: NTA.

NEF (New Economics Foundation) (2010) *Re-imagining the High Street: Escape from Clone Town Britain.* London: NEF.

NESC (1981) *Urbanisation: Problems of Growth and Decay in Dublin.* Dublin: NESC.

Nicolaou, L. (2006) *Principals and Principles - the players and the system: An introduction to Urban Design.* RIAI Conference, Dublin, 23-24th January 2006.

Northern Ireland Executive (2012) *The High Street Task Force Report.* Belfast: Department of Social Development Northern Ireland.

ODPM (Office of the Deputy Prime Minister) (2001) *Mixed Use Development, Practice and Potential.* London: ODPM.

ODPM (Office of the Deputy Prime Minister) (2005) *Planning Policy Statement 6: Planning for Town Centres.* London: ODPM.

ODPM (Office of the Deputy Prime Minister) (2006) *National Land Use Database: Land Use and Land Cover Classification.* Version 4.4. London: ODPM.

Pafka, E. (2013) Places as Intersecting Flows: Mapping Urban Morphologies, Functional Constellations and Pedestrian Rhythms. *Space and Place*. The Space and Place Project: 6th Global Meeting, Oxford, 9-12 Sept 2013.

Panerai, P., Castex, J., Depaule, J.C. and Samuels, I. (2004) *Urban Forms: The Death and Life of the Urban Block.* Oxford: Architectural Press.

Parolek, D.G., Parolek, K. and Crawford, P.C. (2008) *Form-Based Codes: A Guide for Planners, Urban Designers, Municipalities and Developers.* New Jersey: John Wiley and Sons, Inc.

Pauleit, S., Ennos, R. and Golding, Y. (2005) Modelling the environmental impacts of urban land use and land cover change—a study in Merseyside, UK. *Landscape and Urban Planning.* 71, pp. 295-310.

Physical Planning Department, Amsterdam (2006) *Eastern Harbour District Amsterdam: Urbanism and Architecture.* Rotterdam: NAi Publishers.

Pitts, A. (2004) *Planning and Design Strategies for Sustainability and Profit.* Oxford: Architectural Press.

Planning and Development Act, 2000. Dublin: Stationery Office.

Planning and Development Act, 2010. Dublin: Stationery Office.

Portas, M. (2011) *The Portas Review: An Independent Review into the Future of our High Streets.* London: Department for Business, Innovation and Skills.

Power, J. (2011) *Local Heroes: A study of the economic, financial and social significance of the independent retail grocery sector.* [Online] Available at: http://www.rgdata.ie/index.php/planning-pubmenu
Accessed on 12th December 2014.

Prendergast, P. (2011) *Surveying issues for the urban plots.* Interviewed by Conor Norton. PhD Thesis. 7th November 2011. [Interview]

Proverbs, D. and Gameson, R. (2008) *Case Study Research*. In: Knight, A. and Ruddock, L., eds. (2008) *Advanced Research Methods in the Built Environment*. Chichester: Blackwell Publishing Ltd.

Quigley, J. (1998) *Urban Diversity and Economic Growth*. Journal of Economic Perspectives 12(2), pp. 127-138.

Rasmussen, S.E. (1959) *Experiencing Architecture.* Cambridge: MIT Press.

Ratcliffe, J., Stubbs, M. and Keeping, M. (2009) *Urban Planning and Real Estate Development.* 3rd ed. Abingdon: Routledge.

Ratti and Richens (2004) Raster analysis of urban form. *Environment and Planning B: Planning and Design.* 31, pp. 297-309.

Ravenscroft, N., (2000) The vitality and viability of town centres. *Urban Studies.* 37(13), pp. 2533-2549.

REI (Retail Excellence Ireland) (2012) *Town and City Review.* Dublin: Retail Excellence Ireland.

Retail Ireland (2014) *Strategy for Retail 2014-2016.* Dublin: IBEC.

RICS (1998) *Planning Mixed Use Development: Issues and Practice.* London: RICS

Ritchie, A. and Thomas, R., eds. (2008) *Sustainable Urban Design: An Environmental Approach.* 2nd ed. London: Taylor and Francis.

Roberts, M. and Lloyd-Jones, T. (1997) Mixed Uses and Urban Design. In: Coupland, A., ed., (1997) *Reclaiming the City: Mixed Use Development.* London: E and FN Spon.

Roberts P. and Sykes, H. (2000) *Urban Regeneration: A Handbook.* London: SAGE Publications Ltd.

Robson, B.D. and Pace, W. (1983) Renewal and Employment. In: Davis, R.L., ed. (1983) *The Future for the City Centre.* London: Institute of British Geographers.

Robson, C. (2011) *Real World Research: A Resource for Users of Social Research Methods in Applied Settings.* 3rd ed. Chichester: John Wiley and Sons Ltd.

Rogers Merlino, K. (2011) Urban grain and the vibrancy of traditional neighbourhoods: Metrics and measures. In: Architectural Research Centers Consortium (2011) *ARCC 2011, Considering Research: Reflecting upon current themes in architecture.* Detroit, Michigan, USA, 20th to 24th April 2011. Southfield, Michigan: Lawrence Technological University, pp. 477-488.

Rudlin, D. and Falk, N. (2009) *Sustainable Urban Neighbourhood: Building the 21st Century Home.* Oxford: Architectural Press and Falk.

Salat, S. and Bourdic, L. (2010) Power Laws for Energy Efficient and Resilient Cities. *Procedia Engineering.* 21 (2011), pp. 1193-8.

Salingaros, N.A. (2005) *Principles of Urban Structure.* Amsterdam: Techne Press.

Saunders, M., Lewis, P., and Thornhill, A. (2012) *Research Methods for Business Students*. 6th ed. London: Pearson Custom Publishing.

Sekliziotis, S. (1980) *A survey of urban open space using colour infra-red aerial photographs*. PhD Thesis. Aston: University of Aston.

Schiller, R. (1994) Vitality and viability: Challenge to the Town Centre. *International Journal of Retail and Distribution Management.* 22(6), pp. 46-50.

Siksna, A. (1997) The effects of block size and form in North American and Australian city centres. *Urban Morphology.* 1, pp. 19-33.

Simms, A. (1979) Medieval Dublin: A Topographical Analysis. *Irish Geography*. 12(1), pp. 25-41.

Simons, H. (2009) *Case Study Research in Practice.* London: SAGE Publications Ltd.

Six Degrees (2008) *The Fine Grain: Revitalising Sydney's Lanes.* Melbourne: Six Degrees Pty Ltd.

Song, Y. and Knaap, G.J. (2004) Measuring urban form: is Portland winning the battle against urban sprawl? *Journal of the American Planning Association*, 70 (2), pp. 210–190.

Song, Y., Popkin, B. and Gordon-Larsen, P. (2013) A national-level analysis of neighborhood form metrics. *Landscape and Urban Planning*. Issue 116, pp. 73-85.

Song, Y. and Rodriguez, D. (2005) *The Measurement of the Level of Mixed Land Uses: A Synthetic Approach.* Carolina Transportation Programme, White paper Series.

Stake, R.E. (1995) *The Art of Case Study Research.* London: SAGE Publications Ltd.

Stanford University (2015) Conceptual Models. [online] Available at: http://web.stanford.edu/group/ncpi/unspecified/student_assess_toolkit/conceptualModels.html
Accessed on 20 March 2015.

Stern, R. (2010) Diversity and Urban Governance. In: Wanjiku Kihato, C., Massoumis, M., Ruble, B., Subirós, P. and Garland, A. (2010) *Urban Diversity: Space, Culture and Inclusive Pluralism in Cities Worldwide.* Washington: Woodrow Wilson Center Press.

Stouten, P. (2008) *Changing Contexts in Urban Regeneration: 30 Years of Modernisation in Rotterdam.* Amsterdam: Techne Press.

Strathclyde University (2015) *Data analysis in educational research.* [online] Available at: http://www.strath.ac.uk/aer/materials/4dataanalysisineducationalresearch/unit4/correlationsdirectionandstrength/
[Accessed 29th June 2015]

Talen, E. (2003) Measuring urbanism: Issues in smart growth research. *Journal of Urban Design.* 8 (3), pp. 195–215.

Tallon, A. (2010) *Urban Regeneration in the UK.* Abingdon, Oxon: Routledge.

Tarbatt, J. (2012) *The Plot.* London: RIBA.

Town and Country Planning Act 1990. London: HMSO.

Town and Country Planning (General Permitted Development) Order 1995. London: HMSO.

Town and Country Planning (General Permitted Development) Order 2008. London: HMSO.

Tugnutt, A. and Robertson, M. (1987) *Making Townscape.* London: The Mitchell Publishing Company Limited.

Urban Task Force (1999) *Towards an Urban Renaissance.* London: Urban Design Alliance.

Van den Hoek, J.W. (2011) *Towards a Mixed-use Index (MXI) as a Tool for Urban Planning and Analysis*. PhD Thesis. Delft: Technical University Delft.

Wallace, M. and Wray, A. (2006) Critical Reading and Writing for Postgraduates. 2nd ed. London: SAGE Publications Ltd.

Ward, C. (1989).*Welcome, Thinner City: Urban Survival in the 1990s*. Society Today. London: Bedford Square Press.

Whitehand, J. (2007) *Conzenian Urban Morphology and Urban Landscapes*. Proceedings, 6th International Space Syntax Symposium, Istanbul.

Whitehand, J. (2005) Urban morphology, urban landscape and fringe belts. *Urban Design*. Winter 2005 (93), pp. 19-21.

Whitehand, J. W. R. and Whitehand, S. M. (1984) The Physical Fabric of Town Centres: The Agents of Change. *Transactions of the Institute of British Geographers*, New Series. 9(2) pp. 231-247.

Williams, G. (2004) *The Enterprising City Centre: Manchester's Development Challenge.* London: Spon Press.

Wilson, M. (2013) GIS: A Method and Practice. In: Kevin Ward, ed. (2013) *Researching the City.* London: Sage Publications, pp. 116-134.

Yiftachel, O. and Hedgcock, D. (1993). Urban social sustainability and the planning of an Australian city. *Cities*. 11(2), pp. 139-157.

Yin, RK. (2009) *Case Study Research: Design and Methods*. 4th ed. London: SAGE Publications Ltd.

GLOSSARY OF TERMS

Business Improvement District (BID)	Organisations normally established jointly by local businesses and city authorities to assist in planning, marketing and managing urban centres.
Coarse urban grain	A type of urban grain, which is used to describe the dominance of a pattern of just one or relatively few, medium or large-sized plots in an urban block.
Conceptual model	A visual representation of the theoretical framework and specific variables of interest in the research.
Density-based approaches	Approaches to the analysis of urban form, which use measurements of the intensity of a phenomenon within a standard unit of land area, for example, the density of uses or activities per hectare.
Department store	For the purposes of this research, a single, integrated commercial operation without spatially-independent units or entities, typically comprising a range of retail uses and other related services.
Dependent variable	A variable, which may or may not have a relationship with the independent variable and may or may not change when changes are made to the independent variable.
Diversity	A significant concept in urban and planning theory, with important social, economic and environmental dimensions. Diversity in the built environment has been connected to aspects of health and well-being, urban vitality, economic health, ecology, sustainability and social equity
Fine urban grain	A type of urban grain, which is used to describe the dominance of a pattern of many small plots in an urban block.
Floorplate	The physical extent of the floor of a building.
Footfall	The quantity of pedestrian traffic, typically measured passing a designated point within a set time interval. Footfall is a key indicator of activity and vitality in urban centres
Functional constellation mapping (FCM)	An alternative means of describing local land use mixing, urban grain and local pedestrian movement using point data.
Grid-based approaches	Approaches to the analysis of urban form, which measure the intensity of phenomena within the cells of a grid which is overlaid on a user-defined study area.
Hypothesised relationship	Relationships between variables that are thought to exist but have not yet been proved.
Independent variable	The explanatory variable, which is normally the object of the research or the 'artefact' that is under consideration.
Land Use Frequency	A basic technique for the analysis of land use mix, which records the number of different land use categories in any study area measured against the possible full range of land use categories.
Land Use Mix (LUM)	An entropy-based model for measuring mix of use at different spatial scales.
Mix of use	The mixing of different use types or categories, generally in an urban area. It is an important aspect of the diversity and is sometimes alternatively referred to as 'mix of land use', 'use mix', 'land use mix' or 'mixed use'.

Mixed Use Index (MUI)	A new technique developed in this research for measuring mix of uses, which can also factor vertical mix of uses within buildings.
Mode	The most commonly occuring value in a set of different values.
Pearson's correlation coefficient (or Pearson Product Moment)	An established statistical technique for quantifying the strength of the relationship between two or more variables.
Planning system	The regulatory framework for spatial planning including legislation, administration, policy and plans.
Plot	The extent of a discrete unit of ownership within the urban block. It is spatially independent and it is often has defined by boundary or building walls. It is often subject to processes such as subdivision and amalagamation brought about by planning and development processes.
Plot amalgamation	The process of amalgamating smaller plots to form a larger plot or plots.
Raster	A form of spatial data which stores data in a two-dimensional matrix of uniform grid cells.
Town centre first	An urban planning policy priniciple which prioritises the town centre for certain uses and developments and promotes pro-redevelopment objectives.
Urban centre	The core of the urban settlements of different types and sizes and including terms such as 'city centre' and 'town centre' and 'high street'.
Urban grain	A metaphor for patterning in the urban fabric based on the variety of the patterns observed in the fibres of wood. In recent times it most commonly relates to the patterning of plots within an urban block.
Urban Grain Index (UGI)	A new technique developed in this research for measuring the 'fineness' of urban grain using a grid-based approach.
Urban morphology	The shape and form of settlements at different spatial levels and its primary concern has been the structure of urban form.
Urban regeneration	A comprehensive process of social, economic and environmental renewal in existing urban areas with tangible physical outcomes.
Vectors	A form of spatial data normally consisting of strings of coordinates and lines/chains and polygons of various configurations, which make up base maps or plans.
Viability	A key planning objective for urban centres, which relates to the ability of urban centres to attract and retain investment over the longer-term.
Vitality	A key planning objective for urban centres, which relates to the 'busyness' of urban centres, and is often based on measurements of footfall, rental values and vacancy rates.

APPENDIX A SCOPING INTERVIEWS

Interview notes

Subject:	PhD Research	
Time and date:	15.00hrs	04.11.11
Location:	Law Library, Church Street, Dublin 7.	
In attendance:	Conor Norton	Ms. Ruth Cannon JC

Questions

1. In general terms, how is the subdivision/amalgamation of land carried out/managed in legal and administrative terms in Ireland?
2. What is the area of law/legislation which relates to the subdivision or amalgamation of land into plots/lots/parcels?
3. What is the legal and administrative process?
4. Do you think this process plots is effective/adequate?
5. Do you think there should be other mechanisms in Irish Law to control or regulate subdivision/amalgamation of land?
6. Do you have other issues or topics to highlight, which might be of relevance to the research?

Notes

RC	**Q.1 and 2.** There are no controls in law relating to the subdivision of urban land. There may be some constraint to the subdivision of agricultural land (eg. Land Act, 1961). Sub-division can be done horizontally or vertically, as desired, as long as the subdivision is sufficiently defined. There are significant property issues relating to subdivisions including wayleaves (services) and easements (rights of way) over other properties. An issue that may emerge is if bank takes a charge on land, what is the position relating to another portion where there may be an easement or right of way? Are rights reserved or granted over these lands? The subdivision is carried out under Common Law. The ability to grant a freehold vertically was established by case law (O'Flaherty case). **Q.3** In terms of administration, 'conveyancing' relates to freehold and 'assignment' relates to leasehold. If the property is registered in the land registry, then it is referred to as a 'transfer of interest'. There may be some control on subdivision through a lease (covenant) – by agreement between two parties (Landlord and Tenant Act, 1980). Also, if there is co-ownership between different parties, then they must agree to subdivide by 'partition'. This is the only reference to controlling subdivision in the law (s.31, Land and Conveyancing Act, 2009). The ownership of land is only transferred by deed. There is no other mechanism. **Q.4.** No. Frequent disputes. **Q.5.** Yes. CN: Could planning authorities become involved to vet or verify subdivision? RC: Yes, this would be very useful. **Q.6.** The mapping used to identify plots is not satisfactory. There are frequent boundary disputes. The digitisation of the land registry mapping is continuing, but slowly - there have been complaints about accuracy. A significant issue is the associated rights of way etc, particularly when the sale of land is involved and the mortgage does not include same. The Law (Common Law) may imply an easement (right of way) in any event. Notably, after 12 years 'adverse possession' applies – so the factual situation may be more important than the mapped

	situation. End.

Conor Norton, 7 November 2011

Interview notes

Subject:	PhD Research	
Time and date:	15.00hrs	02.11.11
Location:	Office of Tom Dunne, RECE, DIT	
In attendance:	Conor Norton	Mr. Tom Dunne, Head of School of Surveying and Construction, DIT.

Questions

1. In general terms, how is the subdivision/amalgamation of land carried out/managed in Ireland?
2. In general terms, what broad role do plots play in the development and management of property?
3. How has this role changed over time?
4. The theory of the plot development cycle seems to suggest that, over generations, small plots in urban centres are gradually amalgamated into larger plots, through the development process. Is this your understanding of the process?
5. From a development economics perspective why are small plots, apparently not attractive in new urban centres and why are they being amalgamated in existing centres?
6. What would you consider the positive and negative aspects of small plots in urban centres?
7. Do you think that the small plots have a role in producing sustainable and attractive urban centres in the future?
8. If so, how might this role be developed?

Notes

TD	**Q1, 2 and 3** **Role of surveyors in the past** – developing streets, lots, fostering the use and managing the estate. Once pattern fixed tended to define the pattern for all time. Over time plots need to change. This is now a challenge to site assemble and redevelopment. **Importance of frontage, historically**. Access essential to value. Eg. Extreme cases of shotgun plots in New Orleans. The plot would be square but frontage a premium – so became elongated. **Plot sizes have become a problem** in some cases – Grafton Street. Limitation on space, not meeting with the needs of the modern retailer or shopper. Vertical expansion not possible given amount of space allocated to access and services. Potential to retain plots, while maintaining facade. Conceivable that amalgamated plots could revert to smaller plots over time – if district economy changes to specialty shopping etc. **The size and scale of the plot must relate to the final use**. The nature of the economy is driving a new scale of business/uses and this is impacting on the building requirements. Potential for small plots for small retail and residential. Shopping centres are attractive to developers as they can be effectively managed. Amalgamation can occur on the decision of the centre manager, organically. The high street is different as joining separate titles can be a problem. **Site assembly** can be difficult with small plots as obstacles can emerge such as ransoms as assembly reaches completion. This is avoided in the US for example, with **'eminent domain'** where authorities can step in to acquire property and avoid a 'ransom'. CPO powers have only rarely been used here and only in the public interest. PPPs have potential to avail of these powers. Ultimately, the developer is seeking the most economic outcome. **Q4.** The **reversion to smaller plots** does not generally occur – given the difficulty in assembling a site. However, peculiar circumstances, such as a recession, may dictate subdivision into smaller parcels. Very large plots may not also be viable, given the scale of players and long-term outlook in Ireland. It may also reduce the potential market (purchasers). **Q.5** Another important aspect for potential purchasers is the **guarantee or assurances in relation to the development or management of other plots** within a development. Controlling the user is very important. In the Georgian estates a contract was created, with ground rent and long leases. These mechanisms are not available now following Landlord and Tenant Acts. **Estate management** is consequently more difficult. Fitzwilliam was a more successful estate as it was not broken up and multiple tenancies were controlled.

	Small plots will only happen if there is a potential return. **Only a small section of the city would benefit from fine grain development**. It works in concentration. You cannot have a 'City of Temple Bars'. **Q.6** In terms of benefits, small plots and buildings could give **individuals access to space**, such as **start-up enterprise**. These could be incubators, but if the business needs to grow then the small plot could be an inhibitor and it may need to relocate. It is likely that the use of **small plots/fine grain is recycled more** often than larger plots. Small plot/fine grain development is important to cities as it provides for **serendipity and happenstance – indefinable qualities of successful centres**. Emergent qualities can come from these places. Informal clustering of uses and activities. Economic models of urban areas are not good at picking this up. **Q.7** Small plots always had a role and there has always been some demand for this type of development in any city. The city must be able to provide this and must not **suppress this requirement.** How do we foster this? Allow bigger plots to emerge but during site assembly keep building alive by allowing tenants to remain (without fear of adverse rights). The case of South Anne Street was discussed. The ballroom allowed the assembly to commence. Poor understanding of the pitch. External factors such as Dundrum Centre! Developer has a short-term view – needs to execute quickly, but risks change in the market. The investor has a longer term view, based on wider issues. Planner has even longer term view. **Q.8** Take example of the docklands. Workers and residents need to be polled. The absence of the everyday/occasional uses is a common concern. **Need to establish user attitudes**. End.

Conor Norton, 2 November 2011

Interview notes

	Subject:	PhD Research	
	Time and date:	16.30hrs	07.11.11
	Location:	DIT	
	In attendance:	Conor Norton	Dr. Patrick Prendergast, Lecturer and Land Surveyor, School of Spatial Planning

Questions

1. In general terms, how is the subdivision/amalgamation of land carried out/managed in Ireland?

   There is no control of the process of the subdivision of land. There are a number of practices and recommendations from Land Registry on the pegging out of land before survey – but these are often not acted on. There is no common set of standards to define the process of surveying plots.

   The Land Registry has digitised its database on a county by county basis, over the 2005-2010 period. However, Land Registry mapping is based on OS mapping which is only good to one metre. This is at odds with available technologies (GPS etc.) which can be very precise. The survey of the plot and subdivisions is, in essence, still based on a legacy database from 1880's and 1890's. Precise information on the plot, using existing technologies must be degraded to match the database of the Land Registry.

   The Land Registry comprises **a map and a folio**. The map should be prepared by surveyors. It is now defined by co-ordinates – but it does not define boundaries or include land area. The folio is a written statement prepared by solicitors. It includes the owner's address, the address of the lot, other matters such as easements etc.

2. In general terms, what broad role do plots play in the development and management of property?

   They define rights over land – mainly rights of occupancy and the extent of rights of use. In the nineteenth century the role of the plot was to define rights with some restrictions. This has evolved and the modern concept of the defined plot/lot is threefold:

   I. To define rights;
   II. To define restrictions (such as easements); and
   III. To define responsibilities (such as environmental designations etc).

3. How has this role changed over time?

   As above. There has also been a complete shift to electronic processes.

4. How is the process of land surveying carried out with particular reference to subdividing and amalgamating land?
   Also refer to question 1 above. The **Registration of Title Acts, 1964-2009**, is the primary legislation covering this area.
   The surveyor will prepare the map, although there is no legal requirement for a qualified surveyor. In many instances, empty slots are in-filled in the

land registry to avoid overlap/gaps.

5. Are there particular difficulties associated with small plots from a surveying perspective? How might these be addressed?

It can be more difficult to survey small plots in a dense urban context, but various methods can be used and overlapped, to achieve accuracy.

There is a need to look at the **point and coordinates** system. Defined physical points, for example studs in the ground plane, will remove many of the legal battles associated with land ownership. This is the practice in parts of North America.

There is also a system in the Nordic Countries referred to as **property formation** which precedes the development process. This defines the plot and places physical points/pins in the ground.

There is a need for a **single unified, accurate map of plots**. The current process has resulted in several layers of maps for different purposes, such as title and ownership, planning, compulsory purchase etc.

6. In general terms what would you consider the positive and negative aspects of small plots in urban centres?

The small plot is a **reflection of local or community values**. It provides a long-term gain which passes from generation to generation. It is often at variance with requirement of the current economy. However, there is a need for a mix of plots to allow urban areas to flourish. Small plots also allow **access to property for smaller users and occupiers in the heart of the city**. The control of **retail floorspace** is an interesting, related issue, where the size and scale of the use is being controlled in order to preserve a smaller **grain of use**. The move towards the greater use of Local Area Plans will promote the understanding of these values and present ways in which it might be protected and enhanced.

7. Have you any other comments or observations to make which might be of relevance to the research?

The **current system of surveying is not good enough** to provide a reliable control of subdivisions. It will take a long time to fix this.

There must be a reliable survey to allow control and management of the plot.

Land banks can be formed at will, by amalgamating plots, and this may be contrary to important local and community values.

It is important to remember there are many other controls on ownership in other countries – for example nationality.

A pilot study involving small plots could be carried out in an urban centre, involving accurate survey, local area plan policies and a code for change or redevelopment.

Conor Norton, 22 November 2011

Research questionnaire

Subject:	The role of small plots/fine grain development in creating and sustaining urban centres. Planning mechanisms.	
Time and date:	14.00	15 November 2011
Location:	DIT Bolton Street	
In attendance:	CN	Mr. Niall Cussen, Senior Planning Advisor, Department of the Environment, Communities and Local Government, Custom House, Dublin 2.

Introduction	CN to describe: • The purpose and scope of the research. • The objectives of the questionnaire – to identify larger planning aspects relating to the subdivision and amalgamation of land and the role of small plots. • The use of the information obtained.
Questions	
1	What do you understand as the small plot or fine grain development in existing or new urban centres? The pattern of small plots and the uses and activities associated with them. It is most typically associated with the traditional town centre, particularly the small towns and parts of city centres.
2	In general terms, what broad role do small plots play in urban centres, both existing and planned? It has a key role to play in providing for a mix and diversity of land use. It is very important in providing for choice in terms of retail. Small plots provide much of the character of town centres and this is important for residents, shoppers and visitors.
3	Is there any noticeable trends concerning small plots in urban centres? Redevelopment has reduced the amount of small plots in many small towns and cities. Larger shopping centres have often had a detrimental impact on small plots. There are some cases where they have co-existed in redevelopment (e.g. Ennis and Maynooth

	town centres)
4	Has the planning system any means by which to regulate or influence the subdivision or amalgamation of plots? Control of plots and fine grain is essentially limited to land use management and heritage protection. The development management process is very important as it may allow for protection of some small plots in the context of comprehensive redevelopment proposals.
5	Are there any circumstances where fine grain development should be protected or prescribed by mechanisms in the planning system? The fine urban grain should be identified and analysed in the local spatial plan. Clear objectives should only be set out for urban grain based on robust evidence.
6	Have you any other comments or observations to make? Protection of small plots and fine urban grain must be balanced with the needs of town centres to develop. An area-based approach is very important in securing objectives such as the protection of fine urban grain.

Conor Norton, 15 November 2011